GYPSTEEL
fireproof
FLOORS

STRUCTURAL GYPSUM CORPORATION
NEW YORK, N.Y.

A. I. A. File Number 10 b 21

GYPSTEEL
fireproof
FLOORS

INCLUDING GYPSTEEL POURED-IN-PLACE
ROOF CONSTRUCTION, SUSPENSION TYPE

TRADE-MARK

BULLETIN 25C

STRUCTURAL GYPSUM CORPORATION

Manufacturers and Erectors of Gypsteel Pre-Cast and Poured-in-Place Floors and Roofs

General Office: 53 PARK PLACE, NEW YORK, N. Y.

Branch Offices and Agencies

ALLENTOWN, PA. BUFFALO, N. Y. MONTREAL, QUE. PITTSBURGH, PA. SCRANTON, PA.
BOSTON, MASS. EASTON, PA. PHILADELPHIA, PA. RICHMOND, VA. SYRACUSE, N. Y.
TORONTO, ONT.

Factory: AKRON, N. Y.

INDEX

Gypsteel Construction for Modern Building

MANY radical revisions of standards in the use of "fireproof" materials have been brought about by the development of modern building construction.

As architects, engineers, and fire-underwriters know, mere incombustibility is but one of several essential qualifications for a satisfactory fireproofing material. To perform its proper function in a modern building, such a material must be more than incombustible. It must be *fire-resistive*, possessing a degree of non-conductivity of heat that will effectively protect the supporting structural steel work from injury under the most severe conditions of fire that could exist in the building.

It should also possess a sufficiently low coefficient of expansion to insure against self-destruction, or even serious injury, throughout the unchecked duration of a severe fire, and also during the subsequent application of a stream of water at high pressure.

In selecting a floor system the *dependable strength* of its construction is just as important as its fireproofing qualities. Many floor systems now in use are based upon unique theories, or upon assumptions derived from tests, that cannot be verified by any accepted engineering formula. Even where such calculations may be applied, the strength depends so often upon the human element entering into the installation that the safe load carrying capacity of the floor can only be assured by an extravagant factor of safety.

Gypsteel Floor Constructions, both Pre-Cast and Poured-in-Place, meet all of the very exacting requirements of modern fireproofing. In addition, they embody many distinctive advantages and economies that cannot be obtained by other methods of fireproof construction.

As a result of the most severe fire, water and load tests, conducted by well-known testing laboratories, both types of Gypsteel Floor Construction are approved by the building departments of the principal cities throughout the United States and Canada as standard fireproof construction for floors in buildings of the first class.

Structural Gypsum Corporation offers to architects, engineers and contractors the benefits of the many years experience of its personnel in the design, production, and installation of gypsum floor and roof construction. This experience goes back to the time when gypsum was first introduced for floors and roofs, nearly 30 years ago. Its organization is at all times at the service of those who may desire to consult, or to receive suggestions or assistance in determining the proper type of floor or roof to be used under specific conditions. This and the preparation of estimates impose no obligation.

The Engineering Department includes engineers experienced in steel design and in structural steel shop practice. They are well qualified to offer suggestions and assistance in the design of steel work which will assure the maximum economy in the use of Gypsteel Construction.

The Field Organization is likewise made up of men with many years experience in the installation of gypsum construction. These men work under the supervision of carefully trained foremen and superintendents of equal, and even longer, experience.

HOTEL PENNSYLVANIA, NEW YORK, N. Y.
For the seven addition to this hotel, the largest in the world, Gypsum Pre-Cast Floors were used.
McKim, Mead & White, Architects, New York, N. Y. E. Malcuit, Contractor, New York, N. Y.

PART I

GYPSTEEL

pre-cast

FLOORS

CONTENTS

Gypsteel Pre-Cast Floor Construction

(Patented)

STRUCTURAL Gypsum Corporation has made available, for the first time, a thoroughly practical system of floor construction that meets the highest standards of fire-protection, and at the same time embodies the distinctive advantages of:

Factory-moulded units throughout, delivered at the job dry, ready for erection.

Complete elimination of form-work.

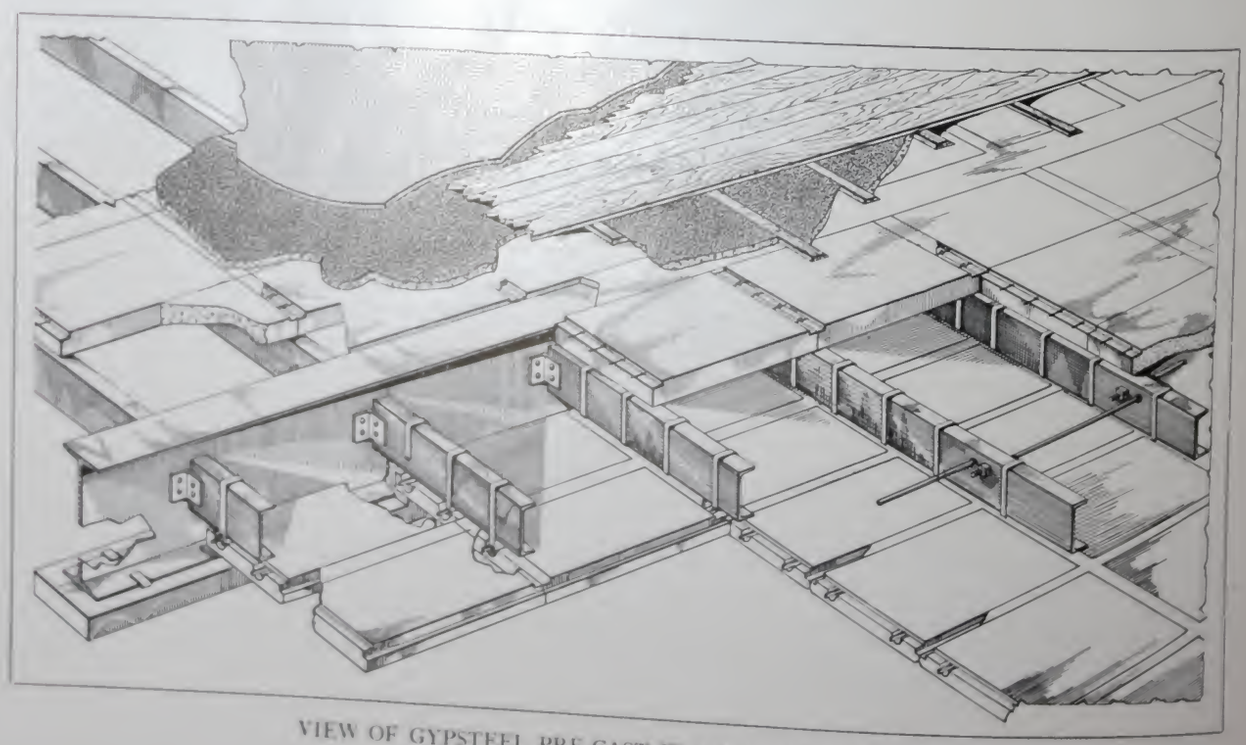
Elimination of water in erection, saving the time heretofore lost in waiting for floors to dry out.

A dead load less than half that of concrete systems for a given live load and span between girders or walls.

Load carried by standard rolled steel structural sections.

Gypsteel Pre-Cast Floor Construction consists of standard structural rolled steel sections (usually channels) spaced 30 inches on centers, on top of which are placed Gypsteel Pre-Cast Floor Slabs, and from which are suspended Gypsteel Pre-Cast Ceiling Slabs.

The ceiling slabs, passing under the lower flanges of the channels, form an



VIEW OF GYPSTEEL PRE-CAST FLOOR CONSTRUCTION

GYPSTEEL PRE-CAST CEILING SLAB

unbroken flat ceiling between the supporting girders or walls. At the same time they completely fireproof the floor channels with a 2 inch protection of gypsum. The slabs are suspended from the channels by *hangers* which *also* are *effectively fireproofed by the slabs*.

The webs and flanges of the girders, where these project below the ceiling slabs, are fireproofed by Gypsteel Pre-Cast Girder Slabs, either 2 or 3 inches in thickness, as may be required by local building laws.

Gypsteel Pre-Cast Floors thus embody two generally accepted principles of modern building construction:

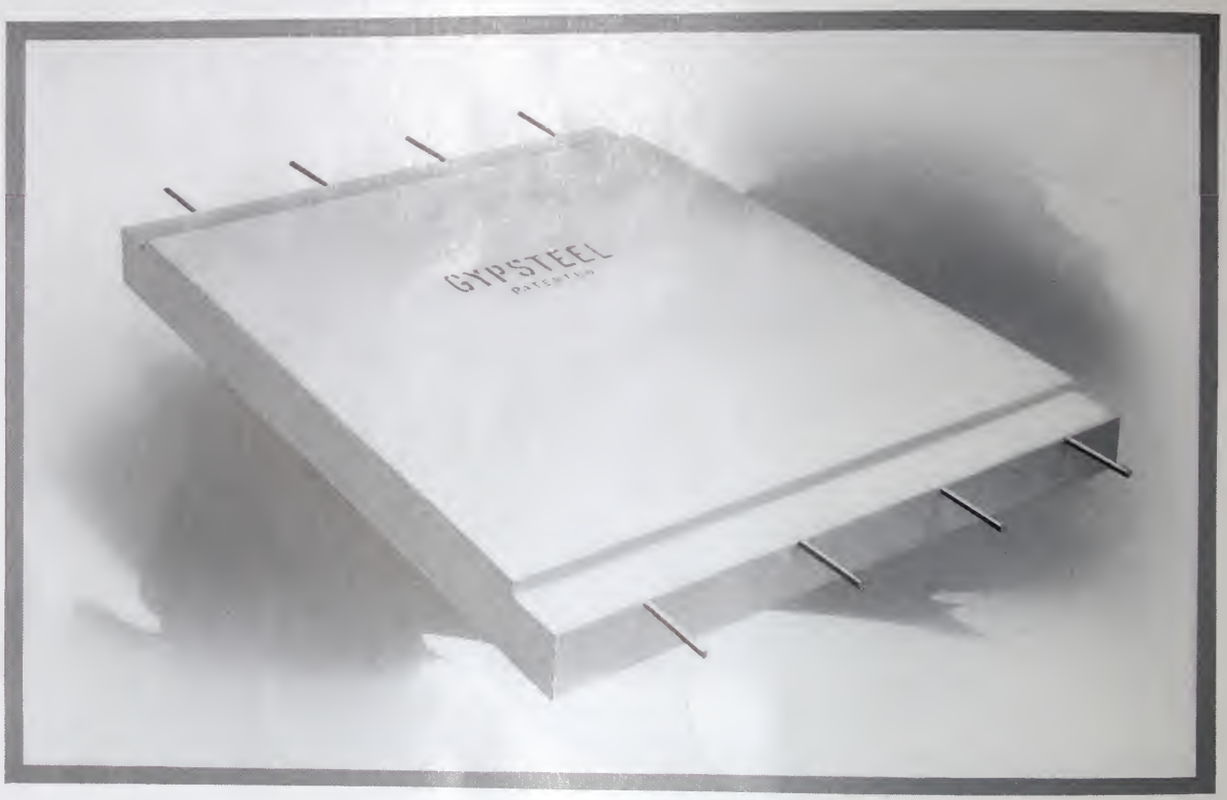
1. The certain, calculable strength and safety of standard rolled steel sections.
2. The unequalled fire-resistive properties and lightness of gypsum.

Gypsteel Pre-Cast Floors are particularly well adapted for:

Apartment Houses	Office Buildings
Hotels	Clubs
Schools	Hospitals

and similar structures where flat ceilings are desired. They are recommended (and approved by the building departments of the principal cities) for live loads up to and including 150 lbs. per sq. ft.

Gypsteel Pre-Cast Floor Construction is covered by United States and Canadian Letters Patent, and by further patents allowed and pending.



GYPSTEEL PRE-CAST FLOOR SLAB

Gypsteel Floor and Ceiling Slabs

Composition

GYPSTEEL Composition, used for both floor and ceiling slabs, is composed of the highest grade calcined gypsum, a small percentage of fine wood planer chips (which act as a binder and impart to the slab its peculiar toughness), and the proper proportion of water. Automatic machines accurately measure and mix these ingredients, assuring a material absolutely uniform in quality. The slabs are then cast in steel molds and delivered to the job dry, ready for erection.

Ceiling Slabs

Each Gypsteel Ceiling Slab is reinforced by means of two $\frac{3}{8}$ in. x $\frac{1}{4}$ in. flat steel bars, placed on edge in the mould when the slabs is cast, and projecting beyond the ends of the slab. These ceiling slabs are made in standard size, 30 in. long, 24 in. wide, and 2 in. thick.

Floor Slabs

Each Gypsteel Floor Slab is reinforced with cold-drawn steel wire rods, $\frac{3}{16}$ in. in diameter, spaced 6 in. on centers, each rod emerging from the ends of the slab within $\frac{3}{4}$ in. of the top surface, and projecting about $2\frac{1}{2}$ in. These rods are accurately formed by special automatic machinery, and are rigidly restrained in the correct position in the mould while the slab is cast, thus assuring uniform strength throughout to resist properly the tensile and shearing stresses that may develop under load. The floor slabs are made in the same standard size as the ceiling slabs, but are $2\frac{1}{2}$ in. in thickness.

Installation of Gypsteel Pre-Cast Floor System

Structural Steel

The floor members consist usually of standard rolled steel channel sections, spaced 30 inches apart, and spanning the distance between the supporting girders or bearing walls. The sections, and their connections, are designed for the required live and dead loads in accordance with the building code requirements in each locality, and with accepted engineering practice.

Gypsteel Ceiling Construction

Sturdy hangers, made of ⅛ in. x 1 in. flat steel, and clamped around the top flanges of the floor channels, pass downward against the backs of the channels, and project the required distance below

HEAVY STEEL HANGER FOR CEILING SLAB

EAGLES CLUB, SYRACUSE, N. Y.

James D. Meehan, Architect, Syracuse, N. Y. Gypsteel Pre-Cast Floors Throughout

the bottom flanges of the channels. In the projecting portion of each hanger is a slot through which pass, in opposite directions, the reinforcing bars of abutting ceiling slabs. The ends of each of these bars, after passing through the slot, rest in pockets moulded in the abutting slabs, and are therefore completely fire-proofed. The portion of the hanger which extends below the slot also slips into one of these pockets, and is likewise effectively protected by the slab from the effect of heat.

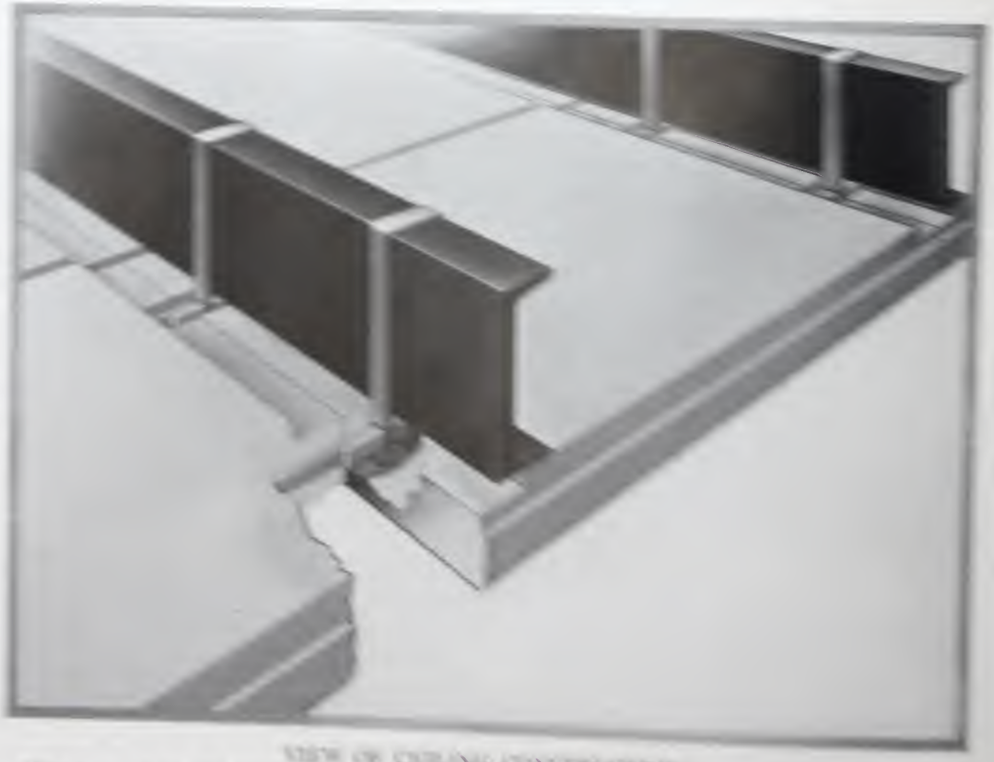
The ends of abutting slabs are rabbeted. Beveled ribs are moulded along the sides of the slabs, at the bottom edges, so that when the ribs on adjacent slabs come together, a slot is formed, ½ in. in width, extending downward from the top surfaces of the slabs. These end and side-joints are solidly filled with gypsum grout, and are thus sealed against the passage of heat or flames from below.

As soon as the ceiling slabs are erected as described above, they are immediately ready for brown and finish coats of plaster. No scratch coat is necessary, as explained on page 27.

Gypsteel Floor Slabs

The Gypsteel Floor Slabs are laid after the ceiling slabs have been hung and grouted.

The floor slabs are set in place upon the steel channels, each slab spanning one of the 36 in. spaces between channels. The projecting reinforcing rods are drawn up taut and tightly tied to the opposite rods in abutting slabs by means of a mechanical device especially designed for



VIEW OF CEILING CONSTRUCTION

Note that the ceiling hangers rest in recessed pockets and are fully protected against effects of fire

METHOD OF HANGING CEILING SLABS

Speed in erection is assured by the simplicity of the construction and precision with which slabs and hangers fit

FASTENING CEILING SLABS

The hangers are quickly clamped around the top flanges of the channel beams

GROUTING THE CEILING SLABS

Seals the joints against the passage of fire

PLACING FIRST SLAB

REINFORCING BARS PROJECTING FROM THE EDGE OF THE SLAB ARE SO CURVED THEY TOGETHER

CUTTING SLABS FOR PASSAGE THE GIRDERS

this purpose. These ties are then hammered down and made to lie in the depressions formed by the rabbetted ends of abutting slabs, which are then filled solidly with gypsum grout, and smoothed off flush with the top surfaces of the slabs.

Thus the steel reinforcement not only is continuous throughout each run of slabs, imparting to the construction the strength and safety of a continuous beam, but also serves to hold the slabs firmly in position. An individual slab cannot become unseated or fall out. Repeated tests have shown that these ties, embedded in the gypsum grout, will in every case hold firmly until the rods have snapped in tension as a result of being stressed to their ultimate tensile strength.

The completed Gypsteel Pre-Cast Floor is now ready to receive the cinder fill upon which the floor finish of wood, cement, composition, etc., is laid. Cinder fill, usually 2 in. thick, is laid on top of the Gypsteel Floor Slabs, providing suitable space for the convenient location of electrical conduits which may run transversely to the floor channels, and forming a bed for the finished floor. Only an inexpensive thin mixture need be used, consisting of 1 part of cement to 8 or 10 parts of cinders.

Gypsteel Girder Fireproofing

Where the webs and flanges of girders project below the ceiling slabs, they are fireproofed as follows:

Gypsteel Pre-Cast Girder Slabs, 2 or 3 in. in thickness as may be required by law, are held tightly against the soffits of

DELAWARE AVENUE GRADE SCHOOL, TONAWANDA, N. Y.

Edw. B. Green & Sons, Architects, Buffalo, N. Y. Metzger Construction Co., Contractors, Buffalo, N. Y.

This installation is an economical combination of Gypsteel Pre-Cast Floor Construction where flat ceilings are required, and of Gypsteel Poured-in-Place Construction, where beamed ceilings are permissible

SAKS-HERALD SQUARE, DEPARTMENT STORE, NEW YORK, N. Y.

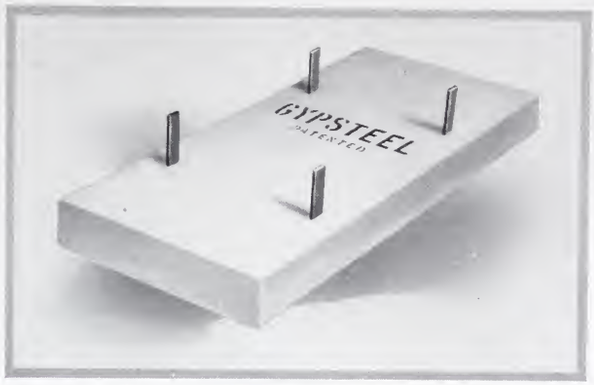
Starrett & Van Vleck, Architects, New York, N. Y. Purdy & Henderson, Engineers, New York, N. Y.

Thompson-Starrett Co., Contractors, New York, N. Y.

By the use of Gypsteel Pre-Cast Construction, the saving in dead load was sufficient to permit the installation of an additional floor and roof.

the lower flanges by means of steel straps, ¾ in. by ⅛ in., snugly clamped around the girder flanges. The straps in each slab are embedded 1 in. above its lower surface, and are thus thoroughly fireproofed, the ends of each strap emerging from the top surface of the slab. These soffit slabs extend not less than 1½ in. beyond the edges of the girder flanges.

The webs of the girders, between the tops of the girder soffit slabs and the ceiling slabs above, are then fireproofed either by means of plastic gypsum, poured in from above and squared off flush with the outer edges of the soffit slabs, or by means of 2 in. Gypsteel Pre-Cast Haunch Slabs, resting upon the projecting edges of the soffit slabs and extending up to the undersurface of the ceiling slabs. The haunch slabs are laid up in gypsum cement mortar.



GYPSTEEL SOFFIT SLAB

Points of Superiority of Gypsteel Pre-Cast Floor Construction

The outstanding advantages of a Gypsteel Pre-Cast Floor are:

Its definite, calculable strength. See page 16.

Its unequalled fire-resistive properties. See page 17.

Its unique sound-deadening features. See page 19.

Its economy, resulting from

1. Standardization of slab sizes, permitting manufacture on a quantity production basis, which assures moderate cost of the slabs. See page 21.
2. Ease and rapidity of installation, requiring a minimum of labor; saving weeks of time in the completion of the building; and thus cutting down carrying charges during construction, as well as permitting return upon building investment at an earlier date. See page 21.
3. Lightness in weight, effecting a substantial reduction in the tonnage both of steel required for girders, columns, and grillage, and of concrete in foundations. See page 22.
4. Elimination of the scratch coat of plaster which is necessary on metal lath ceilings, and of the so-called "bond coat" required upon concrete if the bond with the plaster is to be permanent. See page 23.
5. Facilitating the work of the other trades, such as plumbing, electrical, etc., and reducing the cost of such work. See page 23.

Strength and Safety

THE use of standard sections of structural steel conveys to every architect and engineer a sense of security. The stresses in steel can be calculated with greater accuracy than is possible with any other structural material, and its use reduces the human element to a minimum.

It is these rolled steel sections that impart to Gypsteel Pre-Cast Floor Construction certain, dependable strength and safety. While the loads to be carried are transmitted to the structural channels by means of the Gypsteel Floor Slabs, these slabs span but 30 inches, and possess many times the strength required to support the maximum live load of 150 lbs. per sq. ft. recommended.

In the official load test upon Gypsteel Pre-Cast Floor Slabs, conducted June 25, 1923, by the Columbia University Testing Laboratory for the Bureau of Buildings, New York City, the load was applied at the THIRD POINTS of the span. Failure did not occur until the load had reached 7410 lbs., or 1482 lbs. per sq. ft., equivalent to *ten times* the designed live load of 150 lbs. per square foot.

The full significance of this test is only realized when it is considered that a load of 1482 lbs. per sq. ft., when applied at the third points of the span, is equivalent to a load of 1976 lbs. per sq. ft., uniformly distributed.

ENGINEERING BUILDING
PHONE MORNINGSIDE 1400
EXTENSION 33

Columbia University
Department of Civil Engineering
Testing Laboratories
New York City

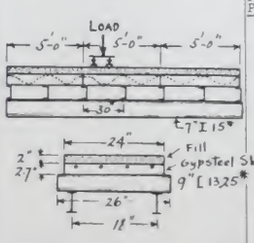
COMMITTEE ON TESTING
E. B. LOVELL, CHAIRMAN OF DEPARTMENT
A. H. BEYER, DIRECTOR OF TESTING
J. K. FINCH, SECRETARY
W. J. KREFELD, ENGINEER OF TESTS

Machine used Olsen 400,000 lb. Date June 25th, 1923.

Tested by W.J. Krefeld, C.F. Orthey Made for Structural Gypsum Corp.
53 Park Place, N.Y.

REPORT OF TRANSVERSE TESTS

Material Tested	Laboratory Test Number	Mark on Test Piece	Diameter or Width, ins.	Thickness, or Height, ins.	Distance between Support, ins.	Total Deflection ins.	Maximum Load, lbs.	Modulus of Rupture lbs. per sq. in.	Average	Remarks
Gypsteel Floor Slab	21962				LOAD TEST ON GYPSTEEL FLOOR SLAB					WITNESSES:



4 Reinforcing wires - 0.191" dia.
2" Cinder Concrete Fill - 1:2:8 Mix.
Load applied at third points of 30" span
Deflections at mid span.

Total Load, lbs. applied at Third Points of 30"-span	Centre Deflections.	Remarks.	Total Load, lbs. applied at Third Points of 30"-span	Centre Deflections.	Remarks.
241	.001		3990	.0255	
438	.001		4120	.029	
569	.002		4250	.065 →	Tension crack across bottom of slab at load point.
701	.003		4380	.075	
832	.003		4520	.081	
963	.004		4650	.088	Crack in top of slab over both supports.
1095	.0045		4780	.095	
1225	.005		4910	.103	
1358	.0055		5040	.111	
1490	.006		5180	.121	
1621	.0065		5310	.130	
1752	.007		5440	.141	
1883	.008		5570	.151	
2015	.009		5710	.162	
2145	.010		5840	.176	
2280	.011		5970	.196	
2410	.0115		6100	.211	
2540	.012		6220	.225	
2675	.013		6360	.244 →	Cracks opened 1/8 inch.
2805	.014		6490	.263	
2935	.015		6620	.306	
3070	.016		6750	.339	
3200	.017		6880	.352	
3330	.018		7010	.377	
3465	.0195		7140	.412	
3595	.021		7270	.477	
3725	.022		7410	Maximum Load - Wires broken	
3855	.0235				

WITNESSES:
J.D. Marder, Bureau of Bldgs., Manhatten, N.Y.
J.J. Mahoney, Commissioner, Building Dept. Boston, Mass.
G.H. Noble, Struct. Gypsum Cor.
A.L. Walker, Struct. Gypsum Cor.
T. Rowen, Struct Gypsum Cor.
J.B. Williamson, Struct. Gypsum Cor.

TESTING LABORATORY COLUMBIA UNIVERSITY

Original Report No. 1305

REPORT OF LOAD TEST OF GYPSTEEL PRE-CAST FLOOR SLABS
Conducted June 25, 1923, by Columbia University Testing Laboratories, New York, N. Y.

HOTEL EAST ORANGE, EAST ORANGE, N. J.
E. V. & C. F. Warren, Architects, Newark, N. J. Harry Kruvant, Owner & Contractor, Newark, N. J.
Because of its unsurpassed fire-resisting properties, Gypsteel Pre-Cast Floor Construction enjoys the lowest insurance rates

Fire-Resistance

GYPSTEEL is not merely incombustible,—it has been proved to be the most efficient insulator against heat, and therefore the most effective fire-protection for steel, of any material that may be used for structural purposes.

The 2 inch Gypsteel Ceiling Slabs provide dependable fire-protection to the floor channels as well as to the hangers by which the slabs are supported. The projecting webs and flanges of the girders are equally protected by the Gypsteel Girder-Soffit Slabs and the plastic gypsum fill.

Gypsteel Pre-Cast Floor Construction is approved as first-class fireproof construction by the building departments of the principal cities. Its outstanding superiority has been shown by the fire, load and water test prescribed by municipal building codes. This test, which was promulgated some years ago by the American Society for Testing Materials, is substantially the same for nearly all large cities. The New York City Building Code describes it as follows:

"Test of Floor Fillings (a) Fire Tests: In testing the fireproof qualities of any floor filling, at least one panel of the proposed maximum span, carrying a live load of at least 150 pounds per square foot, shall be subjected to a fire continuous for 4 hours at an average temperature of 1700 degrees F., followed by the application for not less than 10 minutes of a hose

stream from a 1⅛ in. nozzle at 60 pounds pressure, without appreciable deterioration, or the passage of flame through the floor during the test."*

In the Official Fire, Water and Load Test, conducted December 6, 1922 by the Columbia University Testing Laboratory at its Fire Testing Station, Brooklyn, New York, for the Bureau of Buildings, New York City, a Gypsteel Pre-Cast Floor successfully withstood, without structural injury, both the action of fire, at an average temperature of 1700 degrees F., for 4 hours, and the subsequent application of the hose stream.

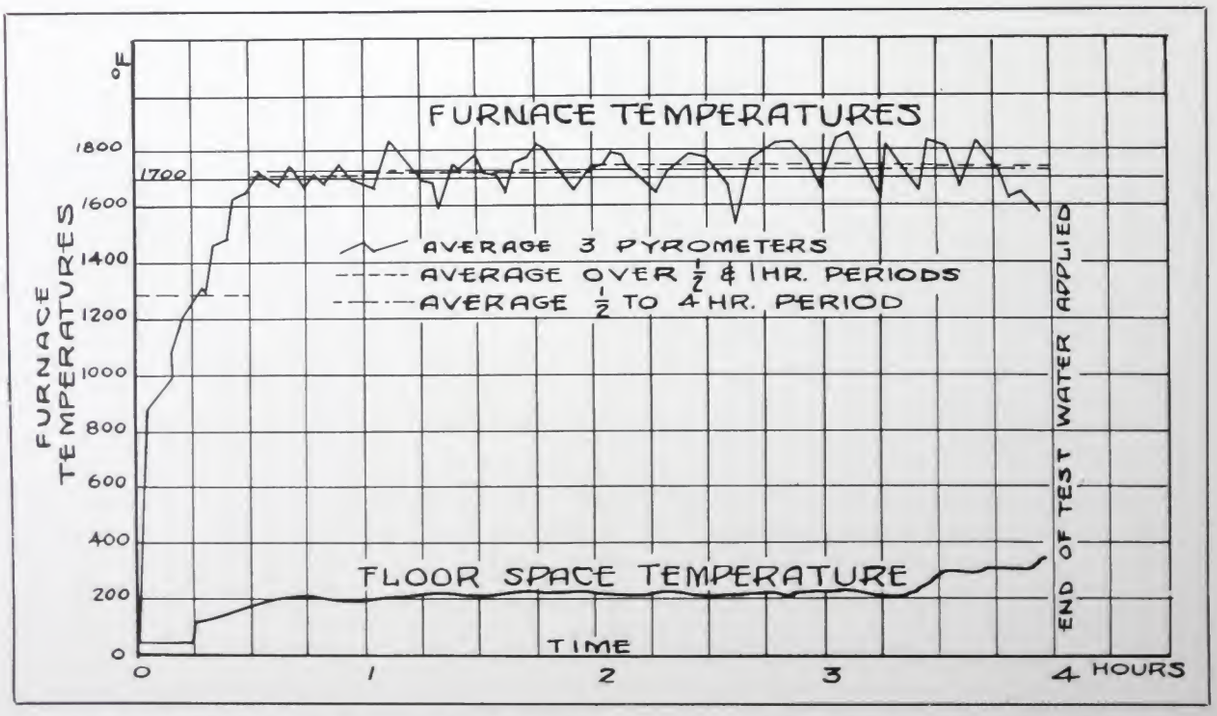
Readings, throughout the test, of calibrated sensitive thermocouples located in the space between the ceiling and the floor slabs showed that *the temperature of the steel floor channels never exceeded 315 degrees F.*

*Laws and Regulations of the Building Code of the City of New York, as amended to May 1, 1922, covering Fireproof Construction, Sec. 354, Art. 5.

In the Building Code recommended by the National Board of Fire Underwriters, Fourth Edition, Revised 1920, gypsum blocks are among the materials specified as permissible for the fire protection of steel members which support loads or resist stresses.

In this same Building Code, Section 114, page 136 states:

"It is well known that steel begins to lose its strength at about 500 degrees F., and at 1000 degrees F., approximately 70% of its strength is gone. Temperatures such as these are easily reached in an ordinary fire, and if maintained even for a short time, are almost sure to produce collapse of exposed steel structural members."



TEMPERATURE CHART FROM OFFICIAL REPORT OF FIRE, LOAD AND WATER TEST OF GYPSTEEL PRE-CAST FLOOR CONSTRUCTION.

Conducted Dec. 6, 1922, by Columbia University Testing Laboratories, New York, N. Y.

Since, as proven by the foregoing test, the temperature of the steel protected by Gypsteel Ceiling Slabs did not exceed 315 degrees at the end of a four-hour fire at 1700 degrees F., the wide margin of safety afforded by Gypsteel Floor Construction is at once obvious.

The official report of this test mentions that, after the test floor had cooled, a short piece of wood, 1 in. by 2 in. in cross-section, was found in the space between the floor and ceiling slabs. Although it had rested upon the ceiling slabs throughout the test, it was not even charred.

Unlike concrete, Gypsteel effectively protects the embedded reinforcement against injury from heat, and the resulting failure of the rods in tension. It is also free from expansion, cracking, spalling or fusing, frequently experienced with concrete in severe fires. *Gypsteel has a co-efficient of expansion of practically zero.*

Sound Deadening

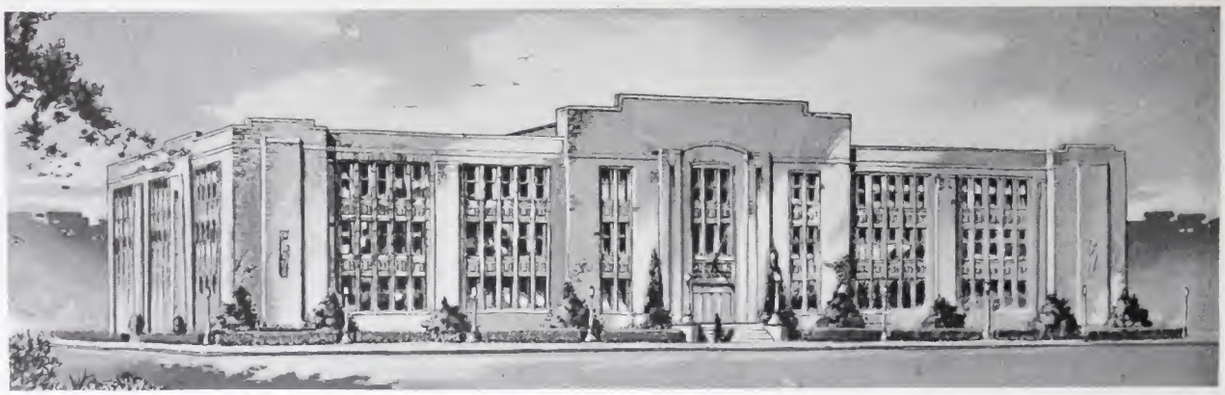
Gypsum is generally recognized as the most effective non-conductor of sound of all structural materials.

When the New England Conservatory of Music in Boston was being erected, its officials expended a considerable amount of money on having exhaustive scientific tests made by disinterested experts to determine the relative efficiencies, in preventing the communication of sound from room to room, of the various

BRISTOL HOSPITAL, BRISTOL, CONN.

Charles S. Palmer, Architect, New Haven, Conn. Lewis A. Miller, Contractor, Meriden, Conn.

The sound-deadening properties of Gypsteel Pre-Cast Floor Construction make it especially suitable for hospitals, hotels, schools and similar buildings



CHRISTOPHER COLUMBUS SCHOOL, BINGHAMTON, N. Y.

Tiffany & Kaley, Architects, Binghamton, N. Y. The Mitchell Const. Co., Contractors, Binghamton, N. Y.

Gypsteel Pre-Cast Floor Construction is a dependable aid in expediting the completion of any building

structural materials available for partitions. As a result of these tests, gypsum blocks were used throughout the structure. Since then, gypsum blocks have become more and more accepted as the ideal fireproof partition where sound-prevention between rooms is essential.

With Gypsteel Pre-Cast Floor Construction, the total of 4½ in. of solid gypsum slabs, together with the dead air-space between the floor and ceiling slabs, affords a degree of insulation against the transmission of sound from floor to floor which cannot be approached by any other type of floor construction.

The value of this feature in apartment houses, hotels, schools, institutions and similar structures, is too obvious to admit of discussion.

Insulation

The unequalled insulating properties of Gypsteel Pre-Cast Floors offer several unique advantages in addition to the protection of the encased steel from injury by fire.

In buildings having other types of floors, where the boiler-plant is located in the basement, the heat so generated frequently raises the temperature of the ground or first floor to a point that causes considerable discomfort in mild weather. Again, where floors are located over driveway entrances, or unheated basements, slabs possessing a high degree of conductivity will result in the discomfort of cold floors during winter weather, increasing substantially the cost of heating these rooms.

These objections are completely overcome with Gypsteel Pre-Cast Floors, owing to their high degree of non-conductivity due to the insulating properties of the two thicknesses of slabs, as well as the dead air-space between these slabs.

Comparative tests, conducted several years ago by Prof. Chas. L. Norton of the Massachusetts Institute of Technology to determine the relative efficiencies of various materials in preventing heat transmission, developed that the conductivity of a concrete slab is ten times that of a Gypsteel Slab of equal thickness.

This factor also minimizes the amount of equivalent direct radiation surface required, and reduces the cost of heating the top floor of a building where Gypsteel Pre-Cast Construction is used for the roof.

The Economy of Gypsteel

Standardized Production

Both the floor and ceiling slabs are pre-cast at the factory upon a quantity production basis. Modern machinery, much of it specially designed, insures the lowest production cost consistent with the highest quality and uniformity of product. The slabs are manufactured only in standard sizes, and large quantities of material are carried in stock at all times. Hence, economy is combined with the ability to make prompt shipment.

Rapidity and Ease of Installation

After the award of the building contract the owner's interest is focused upon only one thing, the date of completion. During construction, vast sums of money are expended monthly, the interest upon which soon reaches substantial totals. The earlier the building can be completed and occupied, the sooner will this unproductive outlay cease, and the owner begin to realize a return from his investment.

The contractor, also, is hardly less concerned than the owner in this time of completion. Often he is under penalty for non-completion on time. In any case, earlier completion means a quicker turnover of his own money, and a reduction in his overhead upon that particular contract.

SIBLEY, LINDSAY & CURR, DEPARTMENT STORE, ROCHESTER, N. Y.
J. Foster Warner, Architect, Rochester, N. Y. A. W. Hopeman & Sons Co., Contractors, Rochester, N. Y.
Six orders, totalling nearly 250,000 sq. ft. of Gypsteel Pre-Cast Floor Construction, and 25,000 sq. ft. of Poured-in-Place Floor Construction

For these reasons, the almost incredible speed with which Gypsteel Pre-Cast Floors can be installed represents a real, calculable saving to both the owner and contractor, running into thousands of dollars upon the average building.

Gypsteel Floor and Ceiling Slabs can be installed far more rapidly than the largest and most experienced crew can erect and rivet the structural steel work. The ceiling slabs are first hung, immediately followed by the setting of the floor slabs as rapidly as the latter can be hoisted.

There is no time consumed in erecting form work, in waiting for concrete to set, or in stripping forms. As NO WATER IS EMPLOYED IN THE INSTALLATION OF GYPSTEEL FLOORS (except the negligible quantity used to mix the grout in the joints), no time is wasted in waiting for floor slabs to dry out to permit plastering of the ceilings.

All these delays and time-consuming operations are avoided with Gypsteel Floors. The many days during which, with other types of construction, no work can be done on the floor below while forms are being erected and concrete poured; the week or more of waiting after the concrete is poured before the forms can safely be dropped; and the further weeks of time, after the forms are removed, before the floor slabs are sufficiently dry to permit of the application of "bond coat" or plastering—all this time is saved with Gypsteel Pre-Cast Floors. As the Gypsteel Ceiling Slabs are dry when placed, partitions could be erected on the floor below, and the *ceilings plastered, the same day that the slabs are installed.*

Winter has no effect upon the progress of a building when Gypsteel Pre-Cast Floors are employed. The floor and ceiling slabs CAN BE INSTALLED IN ANY WEATHER WHEN MEN CAN WORK, irrespective of low temperatures.

Saving in Steel Tonnage

Although Gypsteel Pre-Cast Floor Construction requires steel floor channels spaced 30 in. on centers, the cost of the floor construction plus these channels seldom exceeds and is often less than the cost of the various types of so-called long-span concrete floors for the same span between girders and the same live load capacity.

The extreme light weight of Gypsteel, however, compared with other types of floors, effects a saving in the tonnage of steel required for the girders and columns that usually brings the total cost of the steel work and Gypsteel Floors well below the combined cost of the necessary steel work and any other first-class fireproof floor which gives a flat ceiling underneath. Especially is this so when the saving in the cost of plastering is also taken into consideration. For example, in a 10-story building with columns spaced 20 feet on centers, the saving in dead load effected by Gypsteel Pre-Cast Floors, as compared with a typical long-span tile-and-concrete floor, will amount to *from 50 to 60 tons at each column footing.*

The dead load of Gypsteel Pre-Cast Floor Construction is made up as follows:

TABULATION OF DEAD LOAD

Structural Steel Channels (average)	5	lbs.	per	sq.ft.
Gypsteel Floor Slabs	12	"	"	"
Gypsteel Ceiling Slabs	9	"	"	"
Cinder Fill, 2 in	10	"	"	"
Wood Floor, ⅞ in	4	"	"	"
Plastering (brown and finish coats only)	4	"	"	"
Total dead load with wood floors	44	"	"	"
If cement finish instead of wood, add	8	"	"	"
Total dead load with cement finish floors	52	"	"	"

The light weight of Gypsteel Floors frequently permits adding one or more additional stories to old buildings without overloading the existing columns and foundations. In several instances the use of Gypsteel has permitted two and three new stories to be added to old buildings, where but one could have been added had it been necessary to use concrete or hollow tile floors.

Saving in Plastering

Unlike concrete which, when it has set, affords little or no bond with either Portland cement or gypsum plaster, a gypsum slab forms a natural chemical bond with gypsum plaster that is homogeneous, and makes the two practically inseparable. A single brown coat of gypsum plaster, properly sanded, and the usual finish coat, are all that are required upon Gypsteel Ceiling Slabs.

Thus Gypsteel Construction saves the "scratch" coat of plaster that is always required upon metal lath, and that is the most expensive coat of all.

The "bond coat" upon the underside of concrete which most architects now specify, and which the building departments of many cities require in order to insure a permanent bond between the concrete and plastering, is costly. With Gypsteel, a "bond coat" is never necessary, as the bond between the Gypsteel Slabs and the plastering insures against the danger of falling plaster.

Facilitating the Work of Other Trades

Immediately the Gypsteel Ceiling Slabs are hung, and the Floor Slabs set and grouted, the next steps in the general construction of the building may follow.

HENRY McCARTHY BLDG., SYRACUSE, N. Y.
Howard T. Yates, Architect, Syracuse, N. Y.
Onondaga Engineering Co., Contractors, Syracuse, N. Y.
Erected in 20 working days of extreme winter weather

No time is lost in waiting for concrete to set or dry out. No protection against freezing is required. The cinder fill on top may be laid as soon as convenient.

The ease with which Gypsteel Slabs can be cut, sawed or bored through greatly simplifies and speeds up the installation of plumbing, heating and electrical work. The re-location of conduits or pipes, erroneously installed, is accomplished with ease. Comments from contractors, who have made these installations in buildings where Gypsteel Pre-Cast Floors have been used, all testify to the substantial reduction in their labor costs as compared with installations made where other types of floor construction have been employed.

Gypsteel for Alterations

Frequently it is desired to install mezzanines, balconies, loggias, etc., in existing buildings. Gypsteel Pre-Cast Floors are peculiarly well adapted to work of this kind, which must often be carried out without interfering with the use and occupancy of the floor below.

Eliminating form work, drip, etc., Gypsteel Pre-Cast Floors insure the most rapid completion of the work with a minimum of annoyance to the occupants. In one instance an entire new floor, and in another a large mezzanine, were installed over the main banking rooms of important national banking intitutions, without causing the slightest interruption to the established business routine on the floors below.

FIRST NATIONAL BANK, SCRANTON, PA.
Mezzanine addition
Davis & Lewis, Architects, Scranton, Pa. S. Sykes & Sons, Contractors, Scranton, Pa.
Gypsteel Pre-Cast Construction permits alterations to be made without interfering with the normal operations in the building

Policies and Estimates

GYPSTEEL Pre-Cast Floor Construction is installed, where desired, under contract by our own Construction Department and Field Organization. This organization works under the direct supervision and inspection of our Engineering Department.

This arrangement has many advantages to the architect, contractor and owner. The cost of the work is fixed in advance. The maximum speed of installation is assured by the employment of an experienced and closely coordinated organization specializing upon this type of con-

struction. The highest standards of workmanship are insured. And, most important of all, the responsibility for a satisfactory job is placed directly upon this Corporation, the underlying policy of which has been and will continue to be to stand squarely behind each contract that it executes.

However, where the contractor or owner prefers to handle the erection, we will supply the Gypsteel Slabs, hangers and the necessary gypsum for grouting, f. o. b. cars factory, with freight allowed to destination, together with the services of one of our experienced working foremen to supervise the installation. No charge is made for the services of this man except his actual time and expenses.

Details of Design and Construction

ON pages 28 to 32, details of Gypsteel Pre-Cast Floor Construction are shown applied to a variety of building conditions. The illustrations given may be modified to fit the majority of problems in design. Pages 30 and 31 apply particularly to toilet and other rooms where deep fill is required to conceal large pipes, conduits, etc. Suggestions for balcony framings are given on page 32.

Special problems, that are not covered or cannot be satisfactorily solved from these examples, when referred to our nearest office will be taken up with our Engineering Department which will cheerfully co-operate in reaching a satisfactory solution.

Steel Design

Although this Corporation makes no attempt to assume the legitimate functions of the professional engineer and architect in the design of the steel frame, the tables of safe loads for standard channels given on page 32 will be found useful. From these, the proper size channel may be determined under a given span and total load (exclusive of weight of steel) for a unit stress of either 16000 or 18000 pounds.

DEAD LOADS OF GYPSTEEL SLABS

Thickness inches	Dead Load
Floor 2½	12 lbs. per sq. ft.
Ceiling 2	9 " " " "
Soffit 2	9 " " " "
Soffit 3	14 " " " "
Haunch 2	9 " " " "

Position and Framing of Beams and Girders

All channels or other sections supporting Gypsteel Floor and Ceiling Slabs should have their top flanges in the same plane and be of the same depth in any continuous run.

GYPSTEEL FLOOR AND CEILING SLABS ARE MANUFACTURED IN ONE LENGTH, 2 FT. 6 IN., ONLY. It should be noted that the FLOOR SLABS SPAN FROM CENTER TO CENTER of channels, while the CEILING SLABS SPAN FROM BACK TO BACK. Care must be taken to space the supporting steel so as to provide adequate bearing for the floor slabs, and at the same time permit proper support of the ceiling. This is clearly illustrated in Sections AA and BB on page 28.

With this in mind all spacings should be 2 ft. 6 in. except the last panel, where any odd space LESS THAN 2 ft. 6 in. may be taken up. The slabs for this

ABSENCE OF FORM WORK AND SHORING
Leaves the floor below at all times free for the work of other trades

panel will be cut to fit in the field. Where possible, the columns should be spaced so that the dimensions paralleling the girders will be multiples of 2 ft. 6 in. This permits tie beams, where necessary, being used to support the floor. When such dimensions cannot be maintained and tie beams are required, they should be of a depth not greater than the adjacent channels and are entirely ignored as floor slab supports. Where they must be of greater depth, follow Section EE on page 28.

Channels should be framed with their top flanges 1 in. to 2 in. below the tops of girders. This eliminates coping, reduces girder fireproofing and consequently the amount of girder exposed below, and still permits the top flanges of the girders being covered with a protective layer of Gypsteel Composition. We recommend that channels be ordered plain web punched, while the girders should be riveted and framed.

Bearing Plates

Where the supporting channels have flanges less than 2¼ in. in width, it is necessary to use bearing plates for the temporary support of the floor slabs until the supporting reinforcing rods are tied up and grouted. Where bearing plates are necessary, they are furnished with the Gypsteel Slabs.

Tie Rods

Tie rods should be specified to increase the resistance of floor channels to lateral deflection. Otherwise it is practically impossible for the steel erectors to set and hold them true to line.

Specifications for Pre-Cast Floor Construction

FLOORS and roof shall consist of Gypsteel Pre-Cast Floor Construction, manufactured and installed by (or, under the supervision of) the Structural Gypsum Corporation.

Floor Slabs

These shall be of 2½ in. thick Gypsteel Pre-Cast Floor Slabs moulded at the factory. These slabs shall be reinforced with 3/16 in. cold-drawn wire rods, spaced 6 in. on centers, each reinforcing rod emerging from the ends of the slab within ¾ in. of the top surface, and projecting about 2½ in.

The slabs shall be set in place upon the steel channels, each slab spanning one of the 2 ft. 6 in. channel spaces. The projecting ends of opposite rods in abutting slabs shall be tied together with a mechanical device, furnished by the Structural Gypsum Corporation, by means of which these rods shall be drawn up taut at their connections. When tied, the ends of the rods shall lie in depressions formed by the rabbetted ends of the slabs, and these depressions shall be filled solidly with gypsum grout, and so leveled off as to form an unbroken surface with the tops of the slabs.

Ceiling Slabs

Gypsteel Pre-Cast Slabs, 2 in. thick, shall be suspended underneath the channels to form a flat ceiling and to fireproof the supporting steel. The ceiling slabs shall be reinforced with ¼ in. x ⅜ in. flats, running lengthwise and projecting from the ends of the slabs about 1 in. When erected, the projecting ends shall pass through slots in ⅛ in. x 1 in. straps, clamped around the top flanges of the channels.

Beveled ribs shall be moulded along the sides of the slabs at the bottom edges. The ribs on adjacent slabs, abutting each other, shall form an open joint ½ in. in width extending downward from the top surface. All joints shall be filled solidly with gypsum grout, thus completely sealing them.

Girder Protection

The projecting webs and flanges of the girders shall be fireproofed by applying, to their soffits, Gypsteel Pre-Cast Slabs, 2 in. in thickness; these slabs containing ¾ in. x ⅛ in. flats, the ends of which shall project through the upper surfaces of the soffit slabs and shall be clamped over the girder flanges. Plastic gypsum shall then be deposited in the spaces between the top surfaces of the soffit slabs and the adjacent ceiling slabs, and shall be troweled off square and flush with the outside edges of the soffit slabs. This construction shall give a minimum protection of 1½ in. beyond the outside edges of the steel.

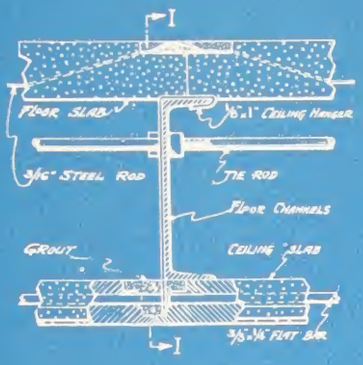
On deep girders and trusses, there may be substituted, for the plastic grout, built-up walls of gypsum blocks not less than 1½ in. in thickness, supported by the bottom flanges of the girders or trusses and the soffit slabs.

Insert in Steel Specifications

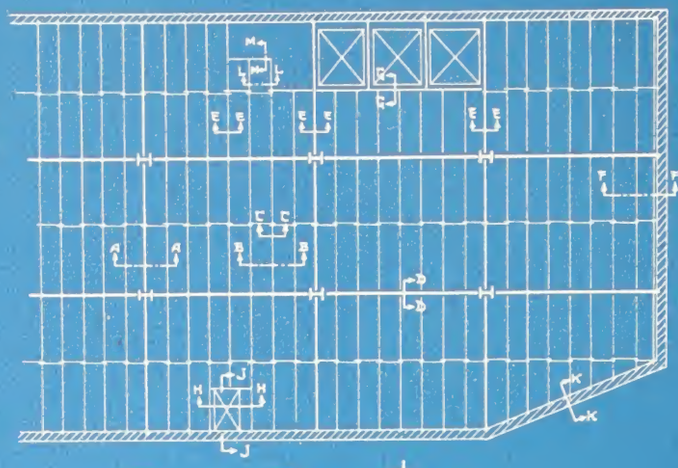
Complete steel erection diagrams and shop details prepared by the steel contractor shall be submitted to and approved by the Structural Gypsum Corporation for details affectingthe Gypsteel Floor Construction (but not for design) before proceeding with fabrication.

SECTION A-A
when I's are necessary

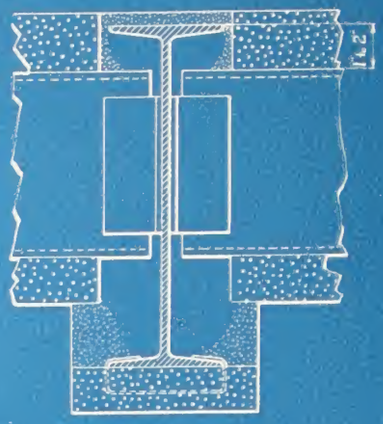
SECTION B-B



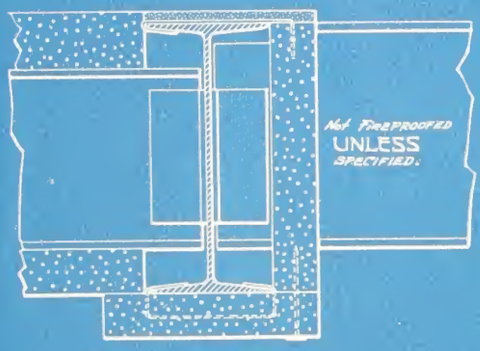
Rod, Floor & Ceiling Block Connection
or DETAIL SECTION C-C
through Channel Joist



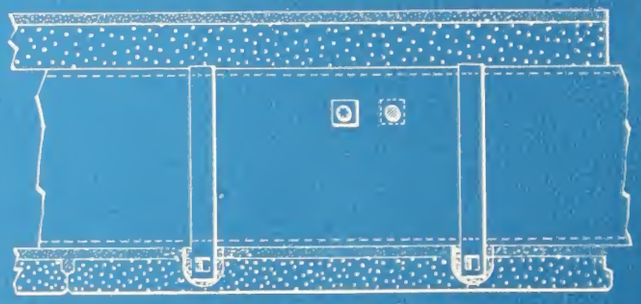
TYPICAL FLOOR PLAN



SECTION D-D
through Girder

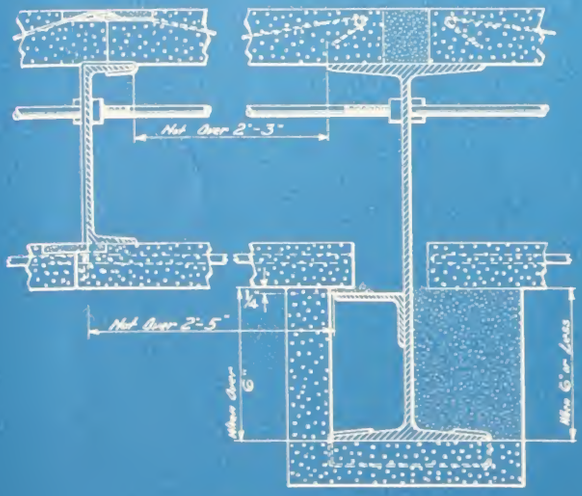


SECTION G-G
(at Elevator)

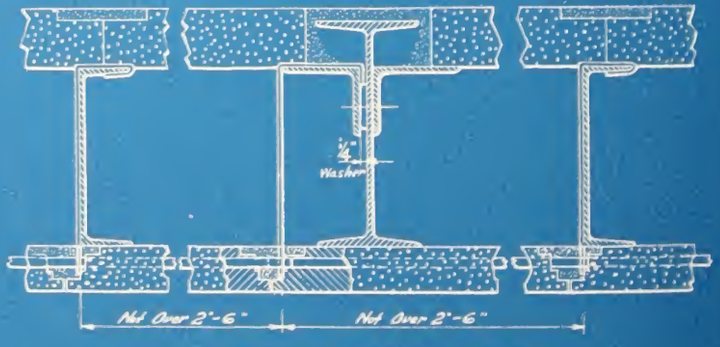


SECTION I-I (see sect. C-C)

TYPICAL DETAILS for PRE-CAST FLOOR CONSTRUCTION

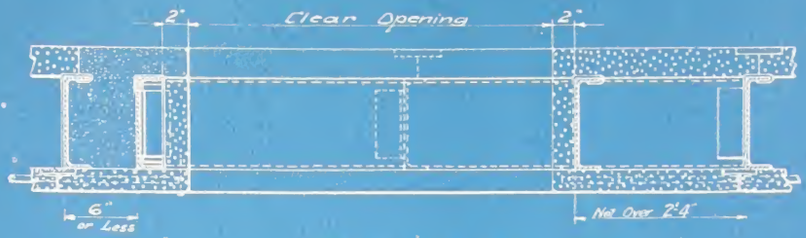


SECTION E-E



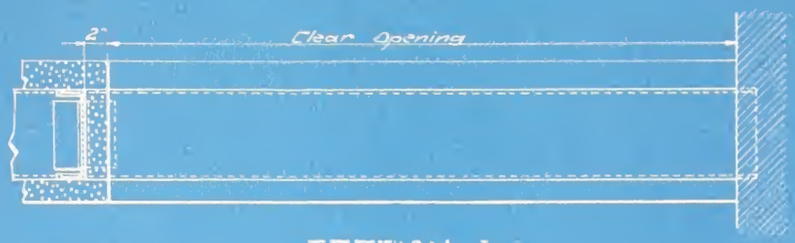
ALTERNATE SECTION E-E
where girder is not more than 2' deeper
than channels

SECTION F·F

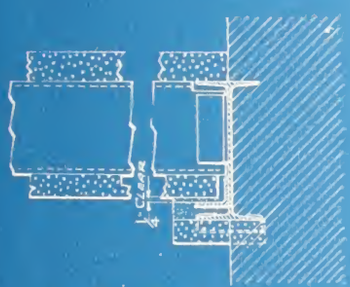


SECTION H·H

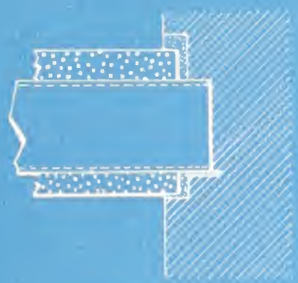
ALT. SECTION F·F



SECTION J·J

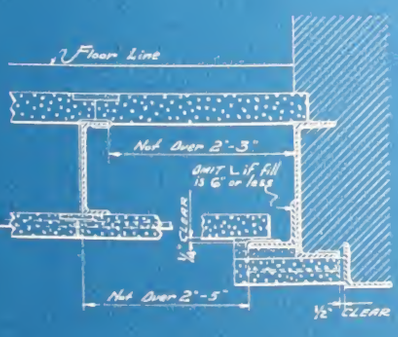


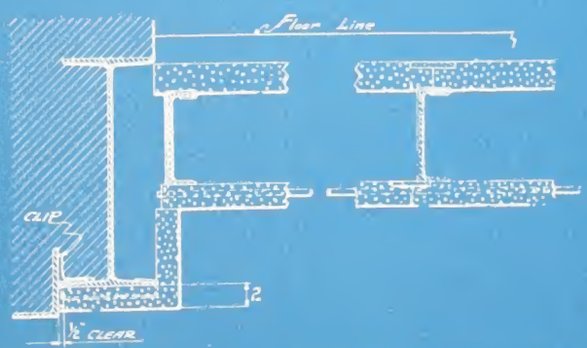
ALT. SECTION K·K



SECTION K·K

DETAIL *at Joist where Ceilings are dropped*

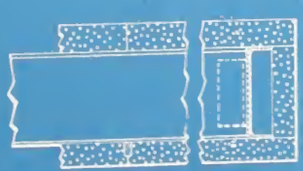




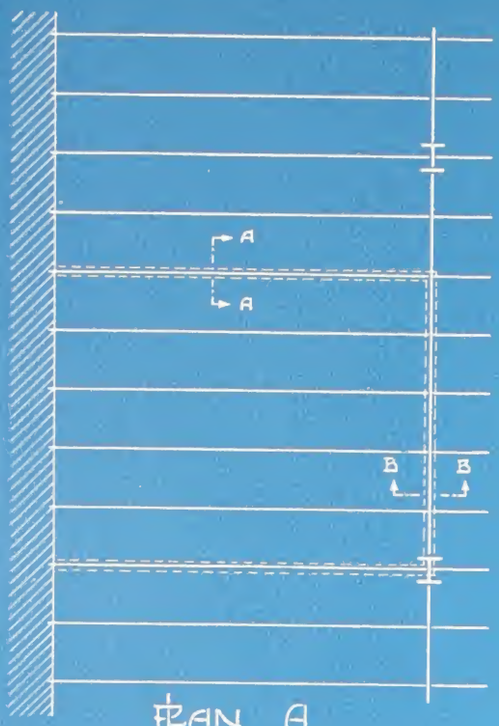
SECTION *showing methods of fireproofing* SPANDRELS *over Windows*

TYPICAL DETAILS for PRE-CAST FLOOR CONSTRUCTION

SECTION L·L

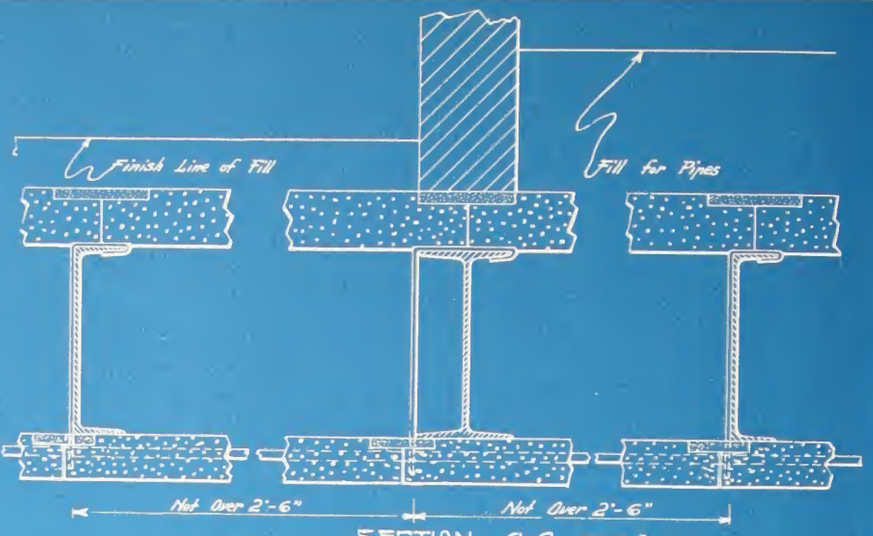


SECTION M·M

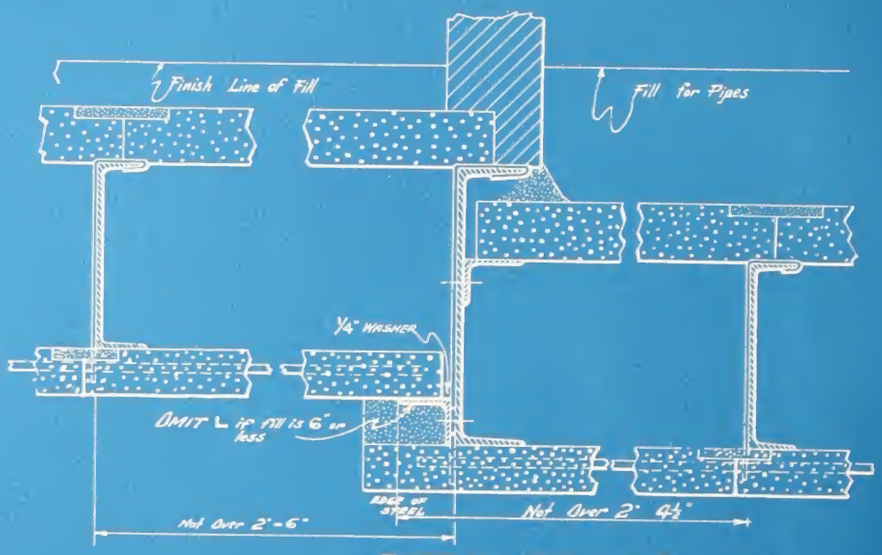


PLAN A

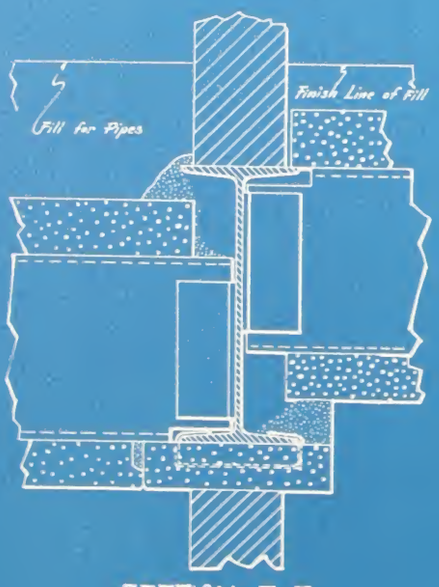
TOILET ROOM DETAILS



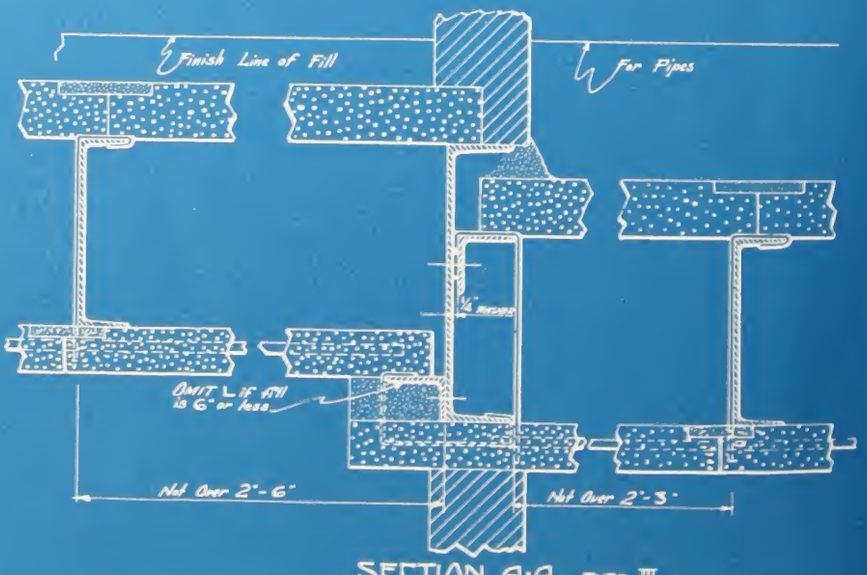
SECTION A-A TYPE I



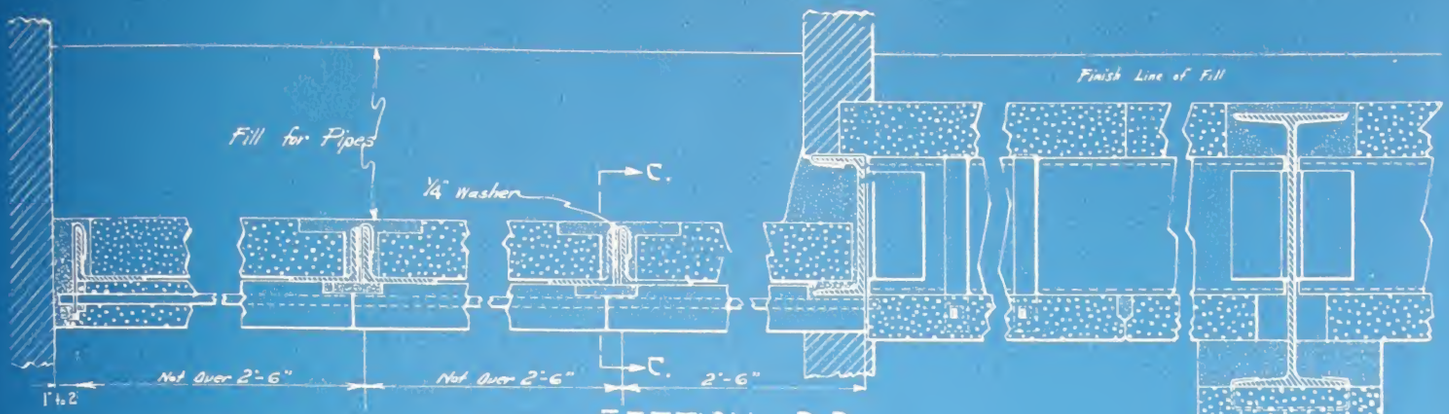
SECTION A-A TYPE II



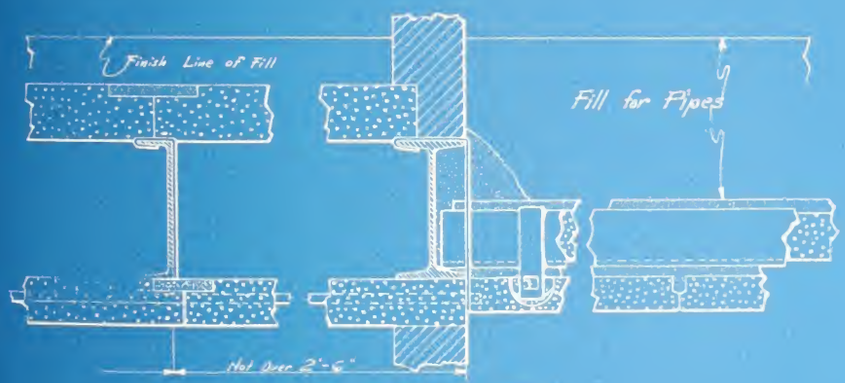
SECTION B-B



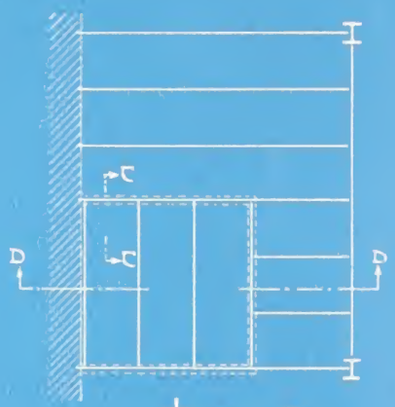
SECTION A-A TYPE III



SECTION D·D

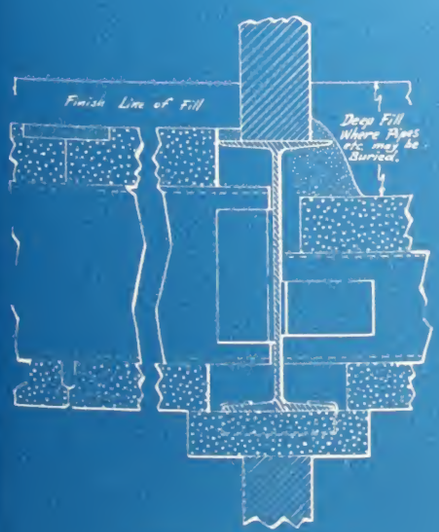


SECTION C·C

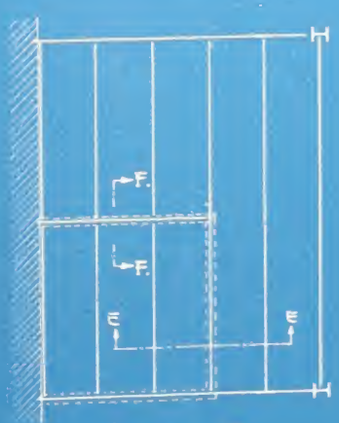


PLAN B

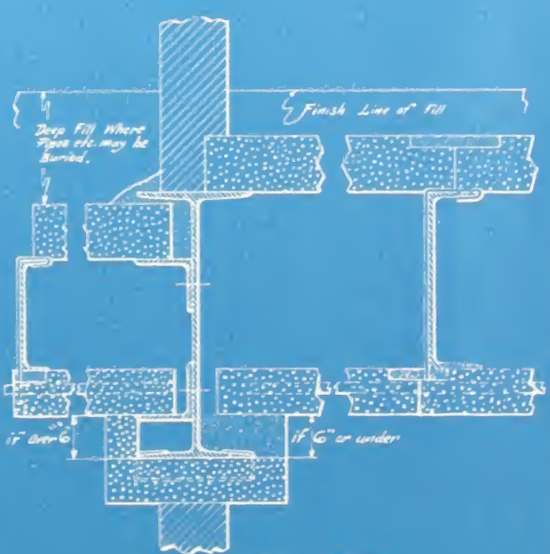
TOILET ROOM DETAILS



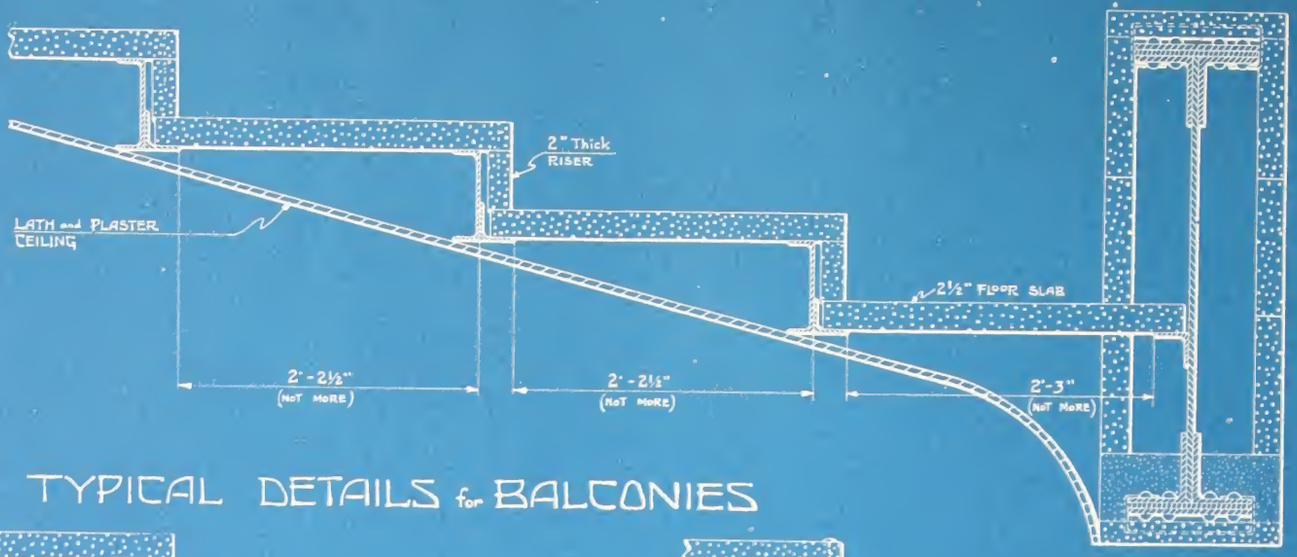
SECTION F·F



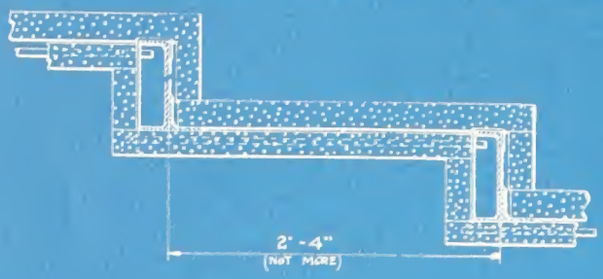
PLAN C

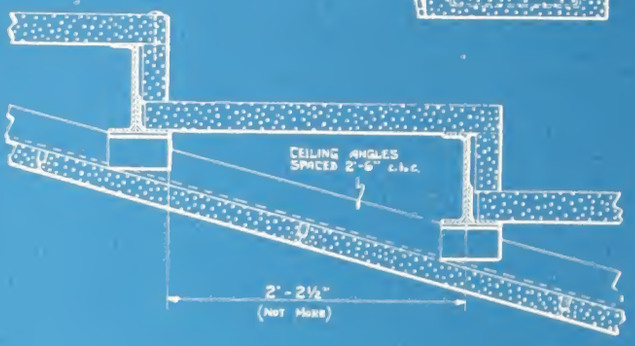


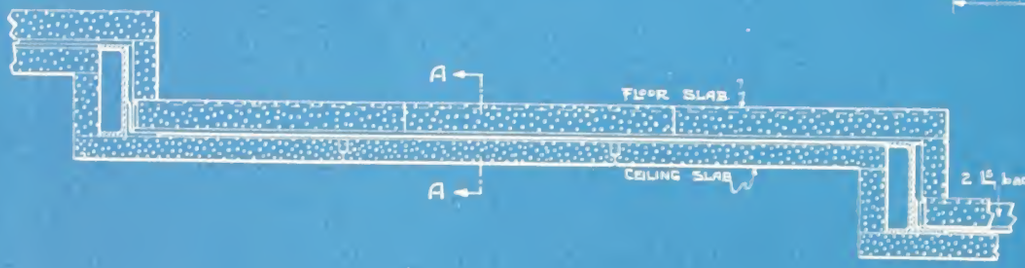
SECTION E·E

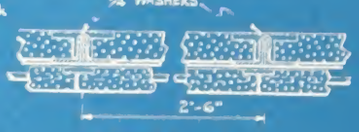


TYPICAL DETAILS for BALCONIES









SECTION A-A

TABLE of SAFE UNIFORMLY DISTRIBUTED LOADS for rolled steel channels supporting GYPSTEEL PRE-CAST FLOORS

NOTE:
CHANNELS SPACED 2'-6" from C. to C.
TO OBTAIN SAFE LIVE LOADS DEDUCT from LOADS GIVEN 39 LBS.
FOR CEMENT FINISH INSTEAD of WOOD FLOOR DEDUCT 47 "
LOADS GIVEN WILL NOT DEFLECT THE CHANNELS
MORE THAN 1/360 OF THEIR SPAN. E = 30,000,000

Loads given are SAFE TOTAL in LBS. per Sq. Ft. exclusive of the weight of channels

DEAD LOAD

FLOOR SLAB	12
CEILING do.	3
2" CINDER FILL	10
WOOD FLOOR	4
PLASTER	4
Total	39 LBS

MAXIMUM EXTREME FIBRE STRESS - 16,000 LBS. Per SQUARE inch
ROLLED STEEL CHANNELS

Depth inches	3	4	5	6	7	8	9	10	12	15
WEIGHT in LBS. per foot	4.1	5.4	6.7	8.2	9.8	11.5	13.4	15.3	20.7	33.9
6	129	223								
7	81	163	250							
8		125	197	250						
9		91	155	223						
10			125	180	250					
11			96	148	208	250				
12				124	174	235				
13				102	148	200	230			
14					127	171	223	250		
15					107	149	194	248		
16					188	130	170	217		
17						112	130	192		
18						94	133	170	250	
19							117	152	244	
20							100	137	220	250
21							86	122	198	250
22								106	180	250
23								92	164	250
24									150	250
25									137	250
26									121	250

MAXIMUM EXTREME FIBRE Stress = 18,000 LBS. Per Sq. inch
ROLLED STEEL CHANNELS

3	4	5	6	7	8	9	10	12	15
4.1	5.4	6.7	8.2	9.8	11.5	13.4	15.3	20.7	33.9
130	250								
81	184	250							
	130	222							
	91	175	250						
		128	203	250					
		96	167	234					
			130	196	250				
			102	166	225				
				133	194	250			
				107	165	219	250		
				88	135	191	245		
					112	166	216		
					94	139	192		
						117	166	250	
						100	143	248	
						86	122	224	250
							106	204	250
							92	179	250
								156	250
								137	250
								121	250

PART II

GYPSTEEL

poured-in-place

FLOORS

For all types of buildings where flat ceilings are not desired, or where the required live load capacity of the floors exceeds 150 lbs. per sq. ft.

CONTENTS

LIFE INSURANCE COMPANY OF VIRGINIA, RICHMOND, VA.

Clinton & Russell, Architects, New York, N. Y. John T. Wilson Co., Contractors, Richmond, Va.

Gypsteel Poured-in-Place Floors throughout. 86,000 sq. ft.

Gypsteel Poured-in-Place Floor Construction

Suspension Type

Method of Construction

TWO-STRAND twisted cables, of cold-drawn steel wire, are spaced from 1 in. to 3 ins. apart (depending upon the spans and the loads to be carried), and are securely anchored at both ends of a series of beams by means of anchors and bars of sections sufficiently heavy to develop the maximum strength of the cables. These cables are put into uniform deflection and tension between each pair of beams by means of continuous deflection rods.

Gypsteel Composition is then poured in place between the beams, upon wood forms or centering, and is brought to a level surface about ¼ in. above the top flanges of the beams. This composition reaches its set in about thirty minutes, and the slab is then ready for the cinder fill and cement or other finish flooring. Where wood flooring is to be laid, the sleepers can be *nailed* into the slab as soon as the latter is dry.

The exposed webs and flanges of the beams and girders are enclosed with wood forms and filled solidly with Gypsteel Composition, giving the required thickness of fireproofing to the webs and bottom flanges of the steel.

Gypsteel Composition consists of the highest-grade calcined gypsum, with

DORMITORY, AMHERST COLLEGE, AMHERST, MASS.
The gift of Mr. and Mrs. Dwight W. Morrow, Englewood, N. J.
McKim, Mead & White, Architects, New York, N. Y. Casper Ranger Const. Co., Contractors, Holyoke, Mass.
Gypsteel Poured-in-Place Floors throughout. 25,000 sq. ft.

STATE & CITY BANK & TRUST CO., RICHMOND, VA.

Clinton & Russell, Architects, New York, N. Y. John T. Wilson Co., Contractors, Richmond, Va.
Gypsteel Poured-in-Place Floors throughout. 115,000 sq. ft.

which is incorporated a small percentage of wood planer chips that act as a binder and impart to the slab its peculiar toughness and elasticity.

Strength

Gypsteel Poured-in-Place Floor Construction is designed upon the principle of the suspension bridge. Its strength can be accurately determined by accepted engineering formulas, as the desired live and dead load capacity of the floor is *calculated upon the structural value of the securely anchored steel cables in suspension and tension*, under a factor of safety of four. Being thus strictly a *steel* system of construction, it affords absolute certainty of strength and safety, and permits of the floor being accurately designed for the spans and loads in each specific case.

The tables of safe loads (page 44) are compiled from the foregoing formulas and are the bases of the approval of this construction by the building departments of the principal cities. Table 1 applies where the building law allows a working fibre stress of 20,000 lbs. per sq. in. for cold-drawn steel wires. Table 2 is used where the allowable fibre stress is limited to 16,000 lbs. per sq. in.

1841 BROADWAY BUILDING, NEW YORK, N. Y.
C. N. Whinston & Bro., Architects and Contractors, New York, N. Y.
Seven story top addition. 42,000 sq. ft.

During the twenty-five years in which this type of construction has been installed by the personnel of the Structural Gypsum Corporation's organization, no floors have ever failed, nor has a single arch ever fallen out from any cause whatsoever—even during installation. Yet there have been numerous instances where accidental over-loading of floors has occurred, of a severity which would probably have permanently injured or destroyed almost any other type of construction.

In one case, a four-ton safe was dropped from the skids on the twentieth story of an office building, where the floors were designed for the usual office-building load of 75 lbs. per sq. ft. A subsequent examination showed that the safe was carried entirely by the floor slab, and neither touched nor was supported by a beam or girder at any point. Although this load was far in excess of the figured factor of safety, the deflection of the slab was less than 1 in.; there was no evidence of cracks, and when the safe had again been placed on the skids, all of this deflection was recovered.

In another instance, an eight story factory building erected nearly twenty-

HENS & KELLY CO., DEPARTMENT STORE, BUFFALO, N. Y.
Bley & Lyman, Architects, Buffalo, N. Y. Charles Berrick's Sons, Contractors, Buffalo, N. Y.
Gypsteel Poured-in-Place Floors throughout. 135,000 sq. ft.

five years ago, there are heavy machine tools operating on floors originally designed for a live load of 220 lbs. per sq. ft. These same floors are now carrying local loads consisting of steel bars in piles, averaging at least 400 lbs. per sq. ft.; and in a number of instances, heavy machines next to an aisle cause one panel to be fully loaded and the adjacent panel unloaded. Yet these floors today are in as perfect condition as when installed.

Fire-Resistance

Gypsteel Poured-in-Place Floor Construction affords the same fire protection to the encased steel work as is obtained by the use of Gypsteel Pre-Cast Floors. Like the latter, the poured type has successfully withstood, without structural injury to itself or the supporting steel, the standard four-hour, 1700° F. fire, water and load test, and is approved as standard fireproof construction for buildings of the first class by the building departments of the principal cities. And, having a co-efficient of expansion of practically zero, the floors do not injure or destroy themselves from expansion under high temperatures. Nor is there any cracking or flying when the water is applied, as frequently occurs with clay tile and concrete.

Economy

While Gypsteel Pre-Cast Floor Construction is usually the more economical where flat ceilings are desired, Gypsteel Poured-in-Place Construction is usually the less costly where panel ceilings are acceptable, and furring and metal lathing is omitted.

The extreme lightness in weight of Gypsteel Poured-in-Place Floors effects a substantial *saving in the tonnage of steel* beams, girders and columns. When installed, ready for fill on top and plastering underneath, a 4 in. floor slab (the thickness usually employed) weighs but 16 lbs. per sq. ft.—and the principle of design permits of it being installed upon beams spaced up to 8 ft. 4 in. on centers.

In cases where the steel work for a building may have already been fabricated, the use of Gypsteel Poured-in-Place Floor Construction will invariably result in a greatly increased live load capacity,—in many instances the total saving in dead load upon the columns and foundations being sufficient to provide adequate capacity for future stories.

Saving in Erection Time

While there is no type of floor construction on the market that can be installed as rapidly as Gypsteel Pre-Cast Floors, Gypsteel Poured-in-Place Construction effects a very real saving in the time required to erect and complete a building, as compared with the use of any form of concrete construction. The steel cables carrying the entire load in suspension, as soon as the Gypsteel Composition has set hard (which will be within thirty to forty minutes after the pouring, depending upon the temperature conditions), the form work can be removed, and the floor not only will be safe, but can immediately be used under the working load for which it has been designed.

This quick dropping of forms leaves the floor below clear, ready for erection of partitions and work of other trades. The resulting saving in time is obvious as contrasted with concrete floors, where the form work cannot safely be removed in less than from ten days to three weeks after pouring.

Elasticity

The floors of factories, as well as loft buildings occupied for light manufacturing purposes, are constantly subjected to vibrations which often cause cracking in concrete or hollow tile arches. These cracks may not only extend up through the cement or other plastic finish on top, but carry a constant menace from falling pieces to the machinery and workers employed in the building.

The composition of which Gypsteel Floors is cast possesses such a peculiar degree of toughness and elasticity that it successfully resists, without trace of cracking, the most severe vibrations. In the course of load tests attempting to reach the point of destruction, deflections up to 1¼ in. at the center of an 8 ft. span have failed to produce any evidence of cracks. Vibrations are further neutralized by the fact that the slab is poured-in-place *between* the beams and not over their tops, and the restrained cables tie the steel structure firmly together, the floor slab producing no thrust action against the beams.

Non-Corrosiveness

The composition used in Gypsteel Floor Construction has been proven by more than twenty-five years' experience

to be a perfect preservative against corrosion of the encased steel. Floor slabs have been removed in the course of alterations of buildings, after having been in place for this period of time, and the encased cables, as well as the beams and girders, *have invariably been found unaffected by corrosion.*

In one instance, a tank had been set into the floor, the water from which constantly slopped over the sides. When this building was demolished some six or seven years later, notwithstanding the fact that the slab itself was in a thoroughly saturated condition, the embedded steel was found to be perfectly preserved.

Sound Deadening

While, obviously, there is no type of floor construction offering the same resistance to the passage of sound from floor to floor as Gypsteel Pre-Cast Floors, Gypsteel Poured-in-Place Construction approaches this more nearly than any other type of floor, owing to the properties of the gypsum slab. It has none of the resonance which causes sound to pass so readily through concrete. In many factory buildings where this type of floor has been installed, it has been found that running machinery is inaudible on the floors above and below.

WALTER REHRIG BLDG., SCRANTON, PA.
Davis & Lewis, Architects, Scranton, Pa.
21,000 sq. ft. Gypsteel Poured-in-Place Floors completed in 19 working days

Plastered Ceilings

As with the Gypsteel Pre-Cast Construction, when plastering is applied directly to the underside of a Gypsteel Slab, it at once establishes a *natural* bond that is practically homogeneous. No "bond coat" is necessary to the under-side of a Gypsteel Poured-in-Place Floor Slab as with concrete, in order to insure a permanent bond between the plaster and the slab.

Estimates and Installation

Complete proposals for furnishing and installing Gypsteel Poured-in-Place Floor Construction will be promptly furnished upon request. When it can be done conveniently, we suggest sending plans, at our expense, to our nearest sales office. This not only enables us to make up a definite estimate, but permits our Engineering Department to go over all of the details of the steel design, and to incorporate in our proposal an accurate estimate of the total tonnage of steel which can be saved by reason of the lightness in weight of Gypsteel.

As explained in the preceding section, where plans have not yet been drawn, our Engineering Department will cheerfully offer suggestions and assistance in the design of the steel work which will assure the maximum of economy by the use of Gypsteel Floors.

Gypsteel Poured-in-Place Floor Construction is installed only by our own field organization, under superintendents and foremen who have been carefully selected and trained through many years of experience in the construction of this particular type of floor. This long experience has shown that, unlike the installation of Gypsteel Pre-Cast Construction, the service of but one competent foreman to supervise the installation does not suffice. A thoroughly satisfactory job requires a crew having a nucleus of men experienced in this work, including the placing of the cables, the erection of the form work, as well as the mixing, handling and pouring of the gypsum composition.

In addition to definitely fixing the cost in advance, and assuring the maximum speed of installation, this policy produces the highest standard of workmanship and places the responsibility for a permanently satisfactory job directly upon this Corporation.

Details of Design and Construction

THE minimum thickness of slab employed for floors is 4 in., and the maximum spacing of beams 8 ft. 0 in. clear distance between flanges.

Safe Loads

The tables of total safe loads per sq. ft. of floor for various spans, thicknesses of slab and cable-spacing, shown on pages 44 and 45, are based upon the principle of design of the suspension bridge, calculated for each conceivable condition for the sake of convenience.

Table 1 is generally employed, being based upon the usually accepted working fibre stress of cold-drawn steel wire of 20,000 lbs. per sq. in. This table conforms to that prepared by the Bureau of

Buildings of New York City more than twenty years ago, and which has since that time served as the basis of their checking and approval of plans calling for this type of floor construction. It has, however, been extended by including the safe loads, calculated on the identical formula, which will result from intermediate spacings of cables; it also embraces the safe loads for roof construction, where thinner slabs and wider spans may be employed than are permissible with floors.

DEAD LOADS OF POURED-IN-PLACE FLOORS

Slab Thickness inches	Dead Load
*3 Slab	12 lbs. per sq. ft.
*3½ Slab	14 " " "
4 Slab	16 " " "
4½ Slab	18 " " "
5 Slab	20 " " "
Beam and Girder Fireproofing	48 lbs. per cu. ft.

* For roofs only.

Table 2 has been prepared for use in those cities where the existing Building Codes may make no distinction between cold-drawn wire and rolled steel in the allowable fibre stress. The latter table, therefore, is prepared on a basis of an allowable fibre stress of 16,000 lbs. per sq. in., as in rolled steel, which is accomplished by adhering to the same spacing of cables, with but a slight variation in the safe load capacity, but employing cables consisting of No. 11 instead of No. 12 wires.

Laying Out Steel Economically

In designing the steel work it should be borne in mind that the cost, both in labor, and in material for hooks and anchors, is reduced where the beams run transversely to the longest dimension of the building. When the supporting cables in the floor construction can be run the long way of the building, there are fewer hooks and anchors required, and consequently less labor in fastening.

All supporting steel work upon which the Gypsteel Floor rests must be framed with tops in the same plane. This does not, however, necessitate coping of the beams into the girders in the case of floors, as the projecting flange of the girder, if the beam is framed as close to the top as possible without coping, will always be entirely encased and covered by the cinder fill on top of the slab.

Anchorage for Cables

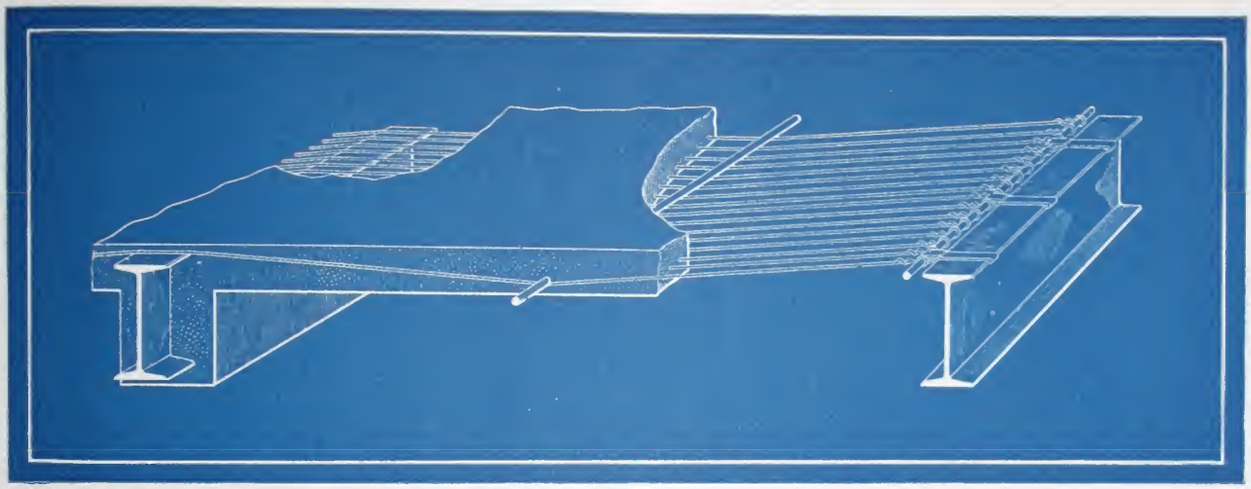
As the peculiar strength of the Gypsteel Poured-in-Place Construction is due to the suspension principle of design, it is obvious that the cables must be securely anchored at their ends. Beams or channels must, therefore, be provided at the sides or ends of the building which parallel the beams supporting the slab. Similarly all openings in the floors must be framed out with suitable steel members, where the dimension of such opening across the cables exceed 24 in. In the case of smaller openings, suitable framing of rods or angles can be installed by us during construction.

Where the end or anchorage members consist of channels, they should invariably be framed with their flanges toward the wall and not less than 1 in. away from same, the cables being fastened by means of anchors and bars furnished and installed by us.

Anchor Beam Bracing

The supporting steel cables being placed in tension as well as deflection, the resulting pull exerted upon the end beams is cared for by means of light truss-bracing as shown by the detail on page 46.

Specifications Poured-in-Place Floor Construction



ALL floors shall consist of Gypsteel Poured-in-Place Floor Construction to be furnished and installed by the Structural Gypsum Corporation.

Forms or centers shall be placed at proper distances below the top flanges of the beams to form a slab __ inches in thickness; and shall also be placed about the webs and bottom flanges of the beams and girders to receive the Gypsteel Composition for the fireproofing of the exposed portions of the same in accordance with standard requirements.

The cables supporting the floor slab shall consist of two number twelve (No. 12) cold-drawn steel wires, twisted, or equivalent; these cables being carried over the tops of the beams, and brought into uniform deflection under round steel bars midway between the beams, which bars shall be placed 1 in. above the under surface of the finished slab. These cables, laid parallel, shall be spaced from 1 in. to 3 in. on centers (depending upon the spans and the loads to be carried), and shall be securely fastened by means of anchors, bars or hooks of a sufficient section of metal to develop the strength of the cables.

The Gypsteel Composition shall be made plastic with water and poured into the wood forms or centers, and shall be brought to a level about ¼ in. above the tops of the beams, left ready to receive fill and finished floor.

Skylight curbs shall be constructed of Gypsteel Composition poured in place between wood forms, reinforced with bars, cables or mesh where the heights exceed 12 in., and left ready for waterproofing. These curbs shall be __ in. thick.

Insert in Steel Specifications

Complete steel erection diagrams and shop details prepared by the steel contractor shall be submitted to and approved by the Structural Gypsum Corporation for details affecting the Gypsteel Floor Construction (but not for design) before proceeding with fabrication.

Insert in Mason's Specifications

In all cases where the erection of walls precedes the installation of the floor construction, or where beams are built into the brick work or other masonry, the mason contractor shall, as his work proceeds, set the necessary anchors, which will be furnished by the Structural Gypsum Corporation, which anchors shall be placed in accordance with instructions to be furnished by said Structural Gypsum Corporation.

TABLE OF TOTAL LOADS

GYPSTEEL

FLOOR AND ROOF CONSTRUCTION

SUSPENSION TYPE

UNIT WORKING STRESS = 20,000 LBS. PER SQ. IN. FOR STEEL

CABLES COMPOSED OF 2 № 12 COLD DRAWN GALVANIZED STEEL WIRES TWISTED

CABLE = 2 x .00874 @ 20,900 LBS. PER SQ IN. = 350 LBS = T

$$W = \frac{1152\,T\,d}{bL\sqrt{L^2 + 16\,d^2}}$$

W = TOTAL SAFE LOAD, LBS.
d = DEFLECTION OF WIRES, IN.
b = CABLE SPACING, IN.
L = CLEAR SPAN, IN.

	SLAB THICKNESS	CABLE SPACING	CLEAR DISTANCE BETWEEN FLANGES OF BEAMS													
			3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"
ROOFS ONLY	WT=12#/FT² 3" d=2	1	450	345	273	221	183	154	131	114						
		¼	360	276	218	177	147	124	105	91						
		½	301	230	182	147	123	103	88	76						
		¾	258	197	156	126	104	88	75	65						
		2	225	172	137	110	92	77	65	57			ROOFS ONLY			
		2¼	200	153	122	99	82	68	58	51						
		2½	180	138	109	88	74	61	53	46						
		2¾	164	125	100	80	67	57	48	41						
		3	150	115	91	74	61	52	44	38						
	WT=14#/FT² 3½" d=2½	1	556	430	340	275	227	193	165	141	124	109	96			
		1¼	445	343	272	220	182	154	132	113	99	87	77			
		1½	370	285	226	184	152	128	110	95	82	73	64			
		1¾	317	245	192	155	130	110	94	82	71	62	55			
		2	278	215	169	138	114	96	82	71	61	55	48			
		2¼	247	191	150	123	102	85	73	63	54	49	42			
		2½	222	171	136	110	91	77	66	57	50	44	38			
		2¾	202	155	124	101	83	70	59	52	45	39	35			
		3	185	143	113	92	76	64	55	47	41	36	32			
FLOORS AND ROOFS	WT=16#/FT² 4" d=3	1	658	508	403	330	270	230	195	169	148	129	115	102	93	83
		1¼	527	406	322	264	216	184	156	135	118	103	91	82	75	67
		1½	438	338	268	220	180	153	130	112	98	86	77	69	62	56
		1¾	376	290	230	188	154	131	111	97	84	74	66	59	53	48
		2	328	254	201	165	135	115	98	84	74	64	57	52	46	41
		2¼	292	226	178	147	120	102	87	75	65	57	51	46	41	37
		2½	264	203	165	131	108	91	78	67	58	52	46	41	37	34
		2¾	240	185	147	120	98	83	71	61	54	47	42	37	34	31
		3	219	169	134	110	90	77	65	57	49	43	38	35	31	28
	WT=18#/FT² 4½" d=3½	1	757	583	466	382	313	264	226	195	172	150	134	120	107	97
		1¼	605	467	373	305	251	212	181	155	137	121	107	96	86	78
		1½	505	389	310	255	209	177	150	130	114	101	89	79	72	64
		1¾	432	334	266	218	179	151	129	111	98	86	77	69	61	56
		2	378	292	233	190	157	132	113	97	85	76	67	60	54	48
		2¼	336	260	207	169	140	118	101	86	76	67	59	54	48	43
		2½	303	234	186	152	126	106	90	78	68	60	54	48	43	38
		2¾	275	213	170	139	114	96	82	71	62	56	49	43	39	35
		3	252	194	155	127	104	88	75	65	57	50	45	40	35	32
	WT=20#/FT² 5" d=4	1	853	660	528	433	358	302	259	224	196	173	153	136	122	111
		1¼	682	528	423	347	286	242	207	179	156	138	123	109	98	89
		1½	569	441	352	288	239	201	172	150	130	115	102	91	81	74
		1¾	487	378	302	247	205	172	147	128	111	98	87	78	70	63
		2	427	330	264	216	179	151	129	112	98	86	77	68	61	56
		2¼	380	294	235	193	159	134	115	100	86	77	68	60	55	50
		2½	341	265	212	173	144	120	104	90	78	69	61	55	49	44
		2¾	310	241	192	157	130	109	94	82	71	62	56	50	45	40
		3	284	220	176	144	120	101	86	75	65	58	51	45	41	37
	5½"	1	944	738	592	483	402	340	290	252	220	193	171	153	138	125
	6"	1	1032	807	648	531	442	374	321	278	243	214	190	170	153	138

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TABLE OF TOTAL LOADS

GYPSTEEL

FLOOR AND ROOF CONSTRUCTION

SUSPENSION TYPE

UNIT WORKING STRESS = 16,000 LBS. PER SQ. IN. FOR STEEL

CABLES COMPOSED OF 2 № 11 COLD DRAWN GALVANIZED STEEL WIRES TWISTED

CABLE = 2 × .011404 @ 16,000 LBS. PER SQ. IN. = 365 LBS = T

$$W = \frac{1152\,T\,d}{bL\sqrt{L^2 + 18\,d^2}}$$

W = TOTAL SAFE LOAD, LBS.
d = DEFLECTION OF WIRES, IN.
b = CABLE SPACING, IN.
L = CLEAR SPAN, IN.

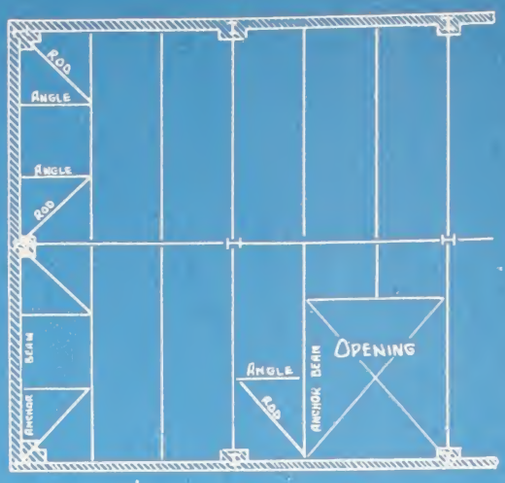
	SLAB THICKNESS	CABLE SPACING	CLEAR DISTANCE BETWEEN FLANGES OF BEAMS 3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"
ROOFS ONLY	WT=12#/FT²	1	470	360	285	231	191	161	137	119						
	3"	1/4	376	288	228	185	153	129	110	95						
		1/3	314	240	190	154	128	107	92	79						
		1 3/4	269	206	163	132	109	92	78	68						
		2	235	180	143	115	96	80	68	59			ROOFS ONLY			
		2 1/4	209	160	127	103	85	71	61	53						
		2 1/2	188	144	114	92	77	64	55	48						
		2 3/4	171	131	104	84	70	59	50	43						
	d=2	3	157	120	95	77	64	54	46	40						
	WT=14#/FT²	1	580	448	355	287	237	201	172	147	129	114	100			
		1 1/4	464	358	284	230	190	161	138	118	103	91	80			
	3 1/2"	1 1/2	386	298	236	192	159	134	115	99	86	76	67			
		1 3/4	331	256	202	162	136	115	98	85	74	65	57			
		2	290	224	177	144	119	100	86	74	64	57	50			
		2 1/4	258	199	157	128	106	89	76	66	57	51	44			
		2 1/2	232	179	142	115	95	80	69	59	52	46	40			
		2 3/4	211	162	129	105	87	73	62	54	47	41	36			
	d=2 1/2	3	193	149	118	96	79	67	57	49	43	38	33			
FLOORS AND ROOFS	WT=16#/FT²	1	687	530	420	344	282	240	204	176	154	135	120	107	97	87
		1 1/4	549	424	336	275	226	192	163	141	123	108	96	86	78	70
	4"	1 1/2	457	353	280	230	188	160	136	117	107	90	80	72	65	58
		1 3/4	392	303	240	197	161	137	116	101	88	77	69	62	55	50
		2	343	265	216	177	141	120	102	88	77	67	60	54	48	43
		2 1/4	305	236	186	153	125	106	91	78	68	60	53	48	43	39
		2 1/2	275	212	168	137	113	95	81	70	61	54	48	43	39	35
		2 3/4	250	193	153	125	102	87	74	64	55	49	44	39	35	32
	d=3	3	229	176	140	115	94	80	68	59	51	45	40	36	32	29
	WT=18#/FT²	1	790	608	486	398	327	276	236	203	179	157	140	125	112	101
		1 1/4	632	487	389	318	262	221	189	162	143	126	112	100	90	81
	4 1/2"	1 1/2	527	406	324	266	218	185	157	136	119	105	93	83	75	67
		1 3/4	451	348	278	228	187	158	135	116	102	90	80	72	64	58
		2	395	305	243	198	164	138	118	101	89	79	70	62	56	50
		2 1/4	351	271	216	177	146	123	105	90	79	70	62	56	50	45
		2 1/2	316	244	194	159	131	111	94	81	71	63	56	50	45	40
		2 3/4	287	222	177	145	119	100	86	74	65	58	51	45	41	37
	d=3 1/2	3	263	203	162	133	109	92	78	68	59	52	47	42	37	34
	WT=20#/FT²	1	890	691	551	452	374	315	270	234	204	180	160	142	127	116
		1 1/4	712	551	441	362	299	252	216	187	163	144	128	114	102	93
		1 1/2	594	460	368	301	249	210	180	156	136	120	107	95	85	77
	5"	1 3/4	508	394	315	268	214	180	154	134	116	102	91	81	73	66
		2	445	345	276	226	187	157	135	117	102	90	80	71	64	58
		2 1/4	396	307	245	201	166	140	120	104	90	80	71	63	57	52
		2 1/2	356	276	221	181	150	125	108	94	81	72	64	57	51	46
		2 3/4	324	251	200	164	136	114	98	85	74	65	58	52	47	42
	d=4	3	297	230	184	150	125	104	90	78	68	60	54	47	43	39
	5 1/2"	1	985	770	616	504	420	354	302	262	229	202	179	160	144	130
	6"	1	1075	840	677	554	462	391	334	290	253	223	199	177	159	144

B.F. 248C

BRACING

SPAN	ANGLE	ROD
7'-0" C to C OR LESS	2"×2½"×¼"	5/8" ϕ
7'-0" 8'-6"	2½"×2½"×¼"	5/8" ϕ
8'-6" - 9'-6"	3"×2½"×¼"	¾" ϕ
9'-6" - 10'-4"	3"×3"×¼"	¾" ϕ

N.B. PLACE FIRST NAMED LEG VERTICAL



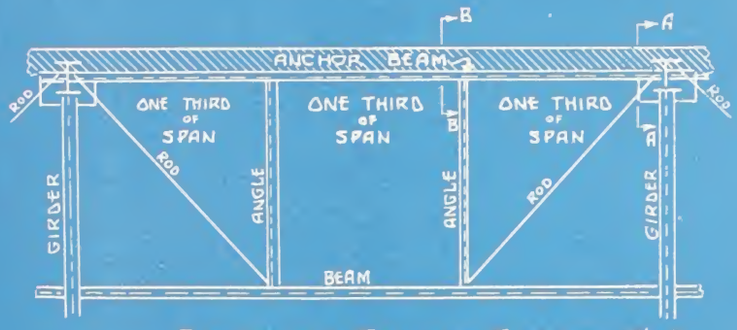
PART PLAN OF TYPICAL FLOOR

WEIGHT OF BRACING PER END BAY

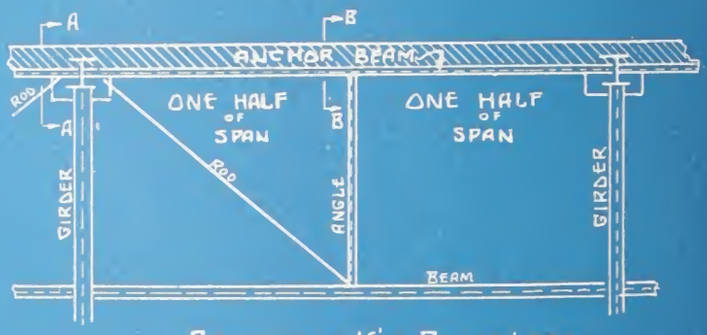
FOR PURLIN SPANS OF 16'-0" OR LESS USE ½ TABLE WT

3" SLAB	SPAN	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"
	WEIGHT	64	68	72	76	80
3½" SLAB	SPAN	7'-0"	7'-6"	8'-0"	8'-6"	
	WEIGHT	88	92	96	100	
4" SLAB	SPAN	8'-6"	9'-0"	9'-6"	10'-0"	10'-4"
	3×2½ L WT.	118	124	130	136	140
	3×3 L WT.	126	132	138	144	148

NOTE: SLAB THICKNESSES GIVEN ARE MINIMUM FOR ROOFS.
ALL FLOORS ARE 4"
MAXIMUM SPAN 8'-0"

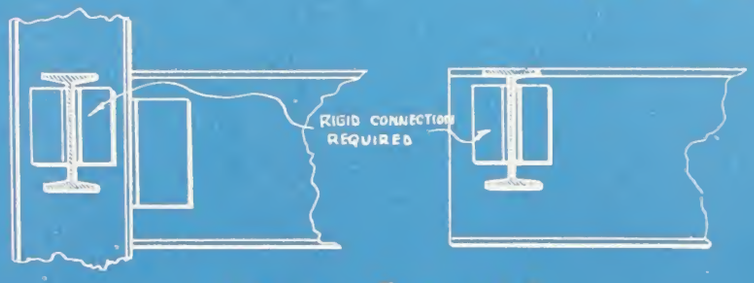


BRACING IN A GREATER BAY THAN 16'-0"

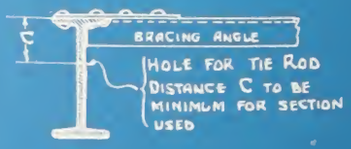


BRACING IN 16'-0" BAY OR LESS

PLAN OF BRACING



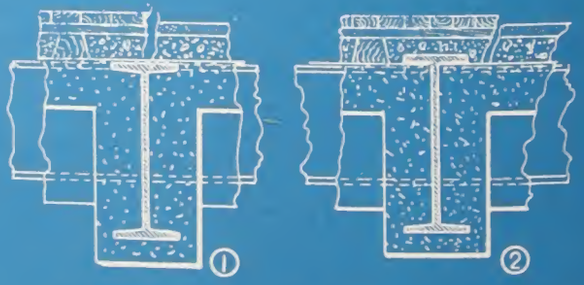
ALTERNATE SECTIONS A-A



SECTION B-B

DETAILS OF ANCHOR BEAM BRACING

SECTIONS THRU STEEL MEMBERS AT OPENINGS IN FLOORS



ALTERNATE DETAIL OF STEEL FRAMING AT GIRDERS

ALL FILLER BEAMS MUST BE FRAMED WITH TOPS IN THE SAME PLANE IF BEAMS ARE FRAMED INTO GIRDER WITHOUT BEING COPED ②, TOP FLANGE OF GIRDER IS EMBEDDED IN CINDER FILL, WITH EITHER WOOD OR CEMENT FLOORING.

PART III

GYPSTEEL

poured-in-place

ROOFS

CONTENTS

Gypsteel Poured-in-Place Roof Construction

Suspension Type

GYPSTEEL Poured-in-Place Roofs are identical in construction with Gypsteel Poured-in-Place Floors, except that the beam and girder fireproofing is usually omitted where the roof structure is supported upon trusses.

In addition to the advantages listed in the poured-in-place floor section, which are equally applicable to roofs, this system offers the distinctive benefits of

Substantial reduction in the initial cost of the heating plant, and a substantial saving in coal consumption; and

Prevention of condensation forming under conditions of high temperature and humidity within the building, combined with winter temperature outside.

Gypsteel Roofs (either Poured-in-Place or Pre-Cast) are used extensively for all permanent buildings by many of the largest and most representative firms in every branch of industry. Years of service have proven their superiority and ultimate economy so conclusively that they are the STANDARD ROOF with many of the leading industrial engineers.

Saving in Fuel and Heating Plant

It has been conclusively demonstrated by scientific tests conducted by government laboratories as well as independent recognized experts that the composition used in Gypsteel Roofs offers the highest insulating value of any structural material.

This property, where Gypsteel Roofs are employed over heated buildings, effects such a substantial saving, compared to other types, in the boiler capacities and radiating areas required, as well as in annual fuel consumption, that Gypsteel Roofs will actually PAY FOR THEMSELVES in a comparatively few years.

Heating and ventilating engineers recognize this fact, and in designing heating plants for buildings roofed with Gypsteel, will take advantage of this saving in heat loss. We will gladly send to those interested reprints of authoritative reports proving this superiority, as well as a table compiled from data contained therein from which it is possible to determine quickly the savings to be effected over other types of roofs for any period of years.

Preventing Condensation

The high insulating qualities, which result in fuel saving where Gypsteel Roofs are used, are responsible for its ability, combined with proper ventilation, to eliminate drip forming on the underside where the operating conditions create relatively high temperatures and humidities in a building.

Condensation or drip is not only a nuisance, but will cause serious damage to electrical apparatus, machinery and to material in storage or manufacture. The continuance of this condition over an extended period will materially shorten the life of any type of roof, causing rapid decay in wood, corrosion in metal, and disintegration in cement and tile roofs.

Gypsteel Composition has *ten times* the insulating efficiency of concrete. Gypsteel Roofs are PROTECTING the

NATIONAL ACADEMY OF SCIENCES, WASHINGTON, D. C.
Bertram G. Goodhue, Architect, New York, N. Y. Charles T. Wills, Inc., Contractors, New York, N. Y.
Gypsteel Poured-in-Place Roofs

equipment and products in the plants of the leaders in the paper, textile and power fields.

The conclusive proof of this superiority is found in numerous technical reports on this subject. We have prepared reprints of an investigation by Prof. Charles L. Norton of the Massachusetts Institute of Technology, and of an address by Mr. Arthur N. Sheldon, of F. P. Sheldon & Sons, Mill Engineers, Providence, Rhode Island, delivered at a meeting of the National Association of Cotton Manufacturers. Charts and tables incorporated in these reports will be of material assistance to the engineer or owner.

Summer Coolness

The same insulating qualities of Gypsteel Roofs that prevent heat loss from the buildings in winter, with the resulting fuel saving, also serve in summer, to keep the heat generated by the sun from being absorbed and penetrating the building.

The experience of many of the industrial concerns having buildings roofed with Gypsteel as well as other materials indicates that those having Gypsteel Roofs will average at least 10° cooler during the summer months.

Waterproofing

Gypsteel Roofs offer a particularly good surface for the application of built-up or composition waterproof roofing. The upper surface is free from the hard, projecting points produced by the stone, slag or cinder aggregates in concrete, which ultimately punch up through the waterproofing when walked upon, resulting in leaks that are almost impossible to locate and correct.

Gypsteel Roofs also hold nails firmly

and permanently, and the first layer of felt is not, therefore, held only by adhesion. Roofing contractors who have had experience in applying waterproofing to Gypsteel Roofs, prefer it to concrete and other types, and will often name a lower price where it forms the base for their work.

Details of Design and Construction

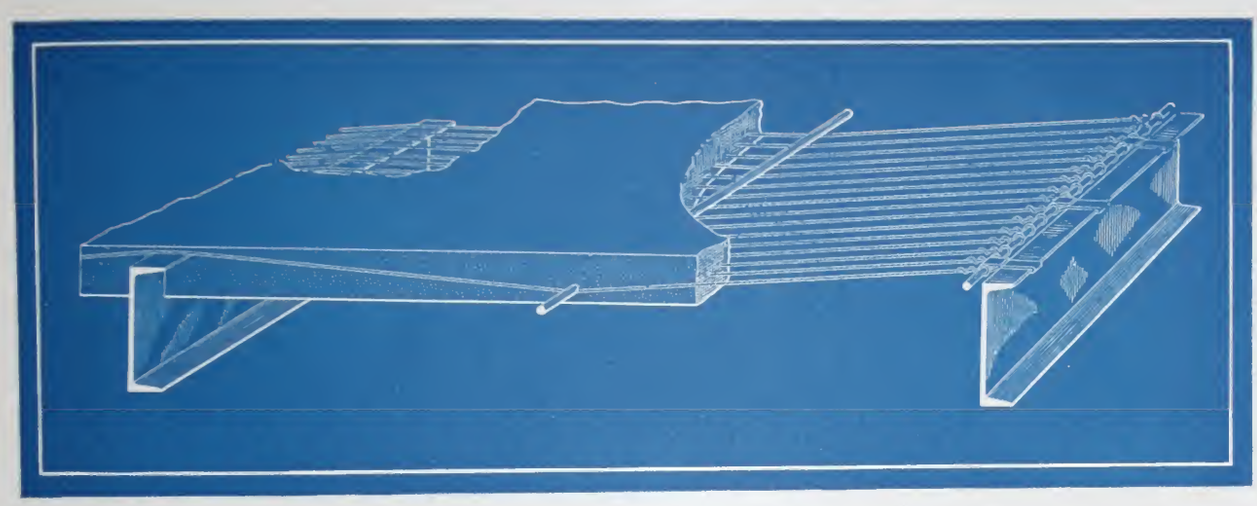
CAREFUL consideration should be given to the notes on Poured-in-Place Floors on pages 41 to 42, as they are equally applicable to roofs, except that the minimum thickness of slab is 3 in. and is used for clear spans between purlin flanges up to 7 ft. 0 in. 3½ in. slabs are used up to 8 ft. 6 in. and 4 in. slabs to 10 ft. 0 in.

Safe load tables, which are explained on page 41, are given on pages 44 and 45.

On pages 52 to 54 are shown details of Gypsteel Poured-in-Place Roofs as applied to the usual types of monitor, double pitched and saw-tooth roof design. These details, with slight modifications, can be adapted to practically any form of roof truss.

ATWATER KENT MFG. CO., PHILADELPHIA, PA.
The Ballinger Co., Architects & Engineers, Philadelphia, Pa. Irwin & Leighton, Contractors, Philadelphia, Pa.
280,000 sq. ft. of Gypsteel Poured-in-Place Roof Construction

Specifications Poured-in-Place Roof Construction



ALL roof decks shall consist of Gypsteel Poured-in-Place Roof Construction furnished and installed by the Structural Gypsum Corporation.

The cables supporting the roof slab shall consist of two number twelve (No. 12), cold-drawn steel wires, twisted, or equivalent; these cables being carried over the tops of the purlins and brought into uniform deflection under steel bars placed midway between the purlins, and ¾ in. above the under surface of the finished slab. These cables, laid parallel, shall be spaced from 1 in. to 3 in. on centers (depending upon the spans and the loads to be carried) and shall be securely fastened by means of anchors, bars, or hooks of a sufficient section of metal to develop the maximum strength of the cables.

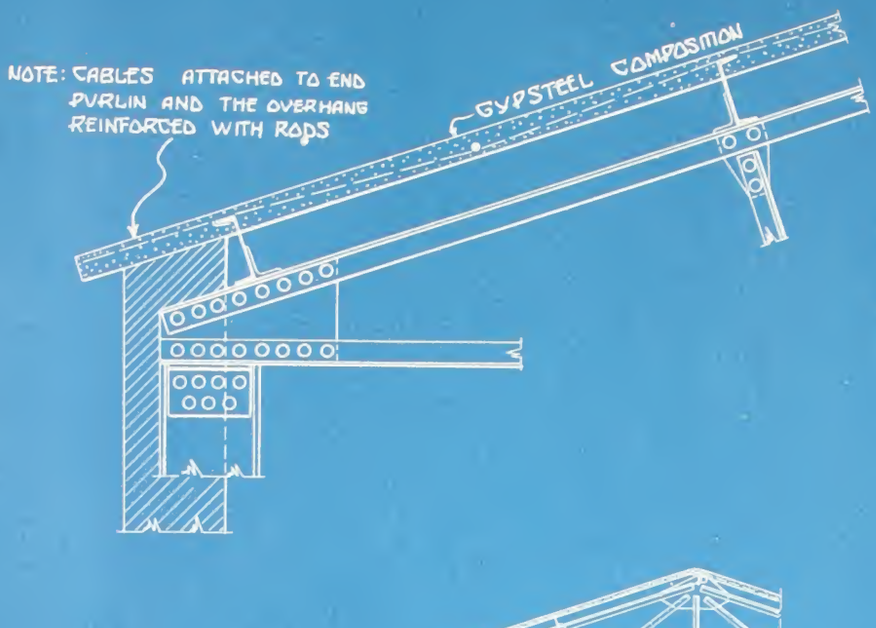
The Gypsteel Composition shall be made plastic with water and poured into forms or centers of dressed lumber, placed at the proper distance below the top flanges of the purlins to form a slab — inches in thickness; and shall be brought to a level about ½ in. above the tops of the purlins, left ready to receive (grading or) waterproofing.

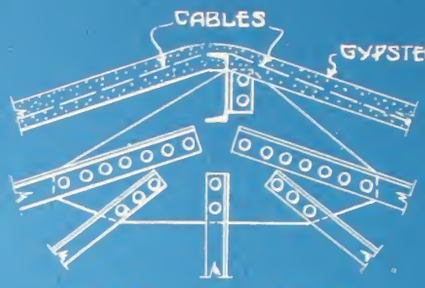
Overhanging eaves shall be formed by extending reinforcing steel, spaced approximately 6 in. on centers, which shall be carried back into the roof slab a distance equal to that of its projection, and securely fastened to the steel cables.

Curbs under and heads over sash shall be constructed by pouring slabs of Gypsteel Composition properly reinforced with bars, cables or mesh, and left ready for waterproofing. Or, where supports for same are provided by the proper spacing and location of angles these curbs and heads may consist of solid blocks of Gypsteel Composition laid in place on such angles, grouted with a gypsum cement mortar, striking all such mortar joints and leaving the outer surface ready for waterproofing.

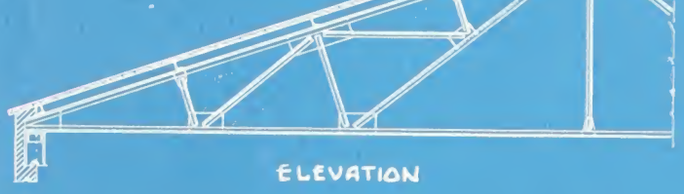
Insert in Steel Specifications

Complete steel erection diagrams and shop details prepared by the steel contractor shall be submitted to and approved by the Structural Gypsum Corporation for details affecting the Gypsteel Roof Construction (but not for design) before proceeding with fabrication.



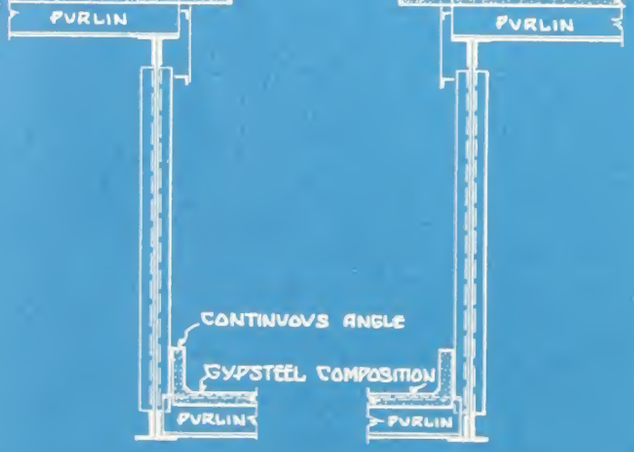


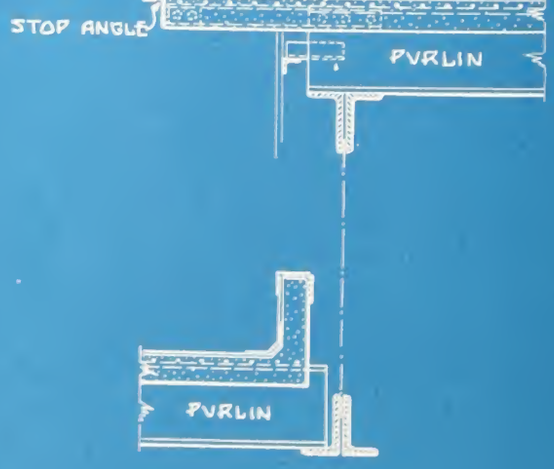
DETAIL AT RIDGE

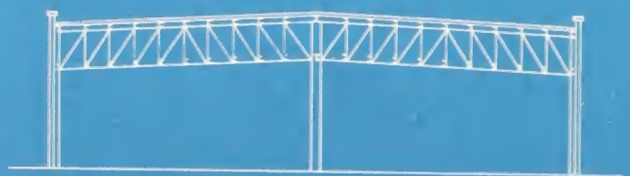


ELEVATION

GYPSTEEL
POURED IN PLACE ON TYPICAL
DOUBLE PITCHED ROOF CONSTRUCTION







ELEVATION OF TYPICAL TRUSS

GYPSTEEL
POURED IN PLACE CONSTRUCTION
ON STANDARD AIKEN ROOF TRUSS

Partial List of Gypsteel Floor Installations

Name	Type*	Location	Architect
Bloomingdale Bros. Dept. Store (addition)	P.C.	New York, N. Y.	Starrett & Van Vleck, New York, N. Y.
Bristol Hospital	P.C.	Bristol, Conn.	Charles S. Palmer, New Haven, Conn.
Christopher Columbus School	P.C.	Binghamton, N. Y.	Tiffany & Kaley, Binghamton, N. Y.
Delaware Ave. Grade School	P.C. & P.I.P.	Tonawanda, N. Y.	Edw. B. Green & Sons, Buffalo, N. Y.
Dormitory, Amherst College	P.I.P.	Amherst, Mass.	McKim, Mead & White, New York, N. Y.
Eagles Club	P.C.	Syracuse, N. Y.	James D. Meehan, Syracuse, N. Y.
Easton Hall, Lafayette College	P.C.	Easton, Pa.	Thomas, Martin & Kirkpatrick, Philadelphia, Pa.
1841 Broadway Real Estate Co.	P.I.P.	New York, N. Y.	C. N. Whinston & Bro., New York, N. Y.
52 Vanderbilt Ave. (additional floor)	P.I.P.	New York, N. Y.	Carrere & Hastings, New York, N. Y.
First National Bank (mezzanine)	P.C.	Scranton, Pa.	Davis & Lewis, Scranton, Pa.
Flint & Kent Dept. Store	P.I.P.	Buffalo, N. Y.	Bley & Lyman, Buffalo, N. Y.
413 W. 14th St. Corp. (addition)	P.I.P.	New York, N. Y.	W. P. Seaver, New York, N. Y.
Grade School	P.I.P.	Olyphant, Pa.	John J. Howley, Scranton, Pa.
Henry McCarthy Bldg.	P.C.	Syracuse, N. Y.	Howard T. Yates, Syracuse, N. Y.
Hens & Kelly Co. Dept. Store	P.I.P.	Buffalo, N. Y.	Bley & Lyman, Buffalo, N. Y.
Hooper School	P.C.	Endwell, N. Y.	Tiffany & Kaley, Binghamton, N. Y.
Hotel East Orange	P.C.	East Orange, N. J.	E. V. & C. F. Warren, Newark, N. J.
Hotel Pennsylvania (top addition)	P.C.	New York, N. Y.	McKim, Mead & White, New York, N. Y.
Knickerbocker Bldg. (mezzanine)	P.C.	New York, N. Y.	Walter T. Williams, New York, N. Y.
Life Insurance Co. of Virginia	P.I.P.	Richmond, Va.	Clinton & Russell, New York, N. Y.
Miller Rhoads Dept. Store	P.I.P.	Richmond, Va.	Starrett & Van Vleck, New York, N. Y.
The Mt. Prospect Apartments	P.I.P.	Newark, N. J.	Shape, Bready & Peterkin, New York, N. Y.
National City Bank (mezzanine)	P.C.	New York, N. Y.	McKim, Mead & White, New York, N. Y.
One W. 67th St. (mezzanine)	P.I.P.	New York, N. Y.	Post & McCord, New York, N. Y.
Pagoda Restaurant (balcony)	P.C.	Philadelphia, Pa.	The Ballinger Co., Philadelphia, Pa.
Roger Williams Apartments	P.I.P.	Providence, R. I.	Shape, Bready & Peterkin, New York, N. Y.
Rubin Bldg.	P.I.P.	Syracuse, N. Y.	Randall & Vedder, Syracuse, N. Y.
Saks-Herald Square Dept. Store (top addition)	P.C.	New York, N. Y.	Starrett & Van Vleck, New York, N. Y.
Scranton Dry Goods Co.	P.I.P.	Scranton, Pa.	Davis & Lewis, Scranton, Pa.
Seligman Bldg. (addition)	P.I.P.	New York, N. Y.	Henry Ives Cobb, New York, N. Y.
Sibley, Lindsay & Curr Dept. Store (additions)	P.C. & P.I.P.	Rochester, N. Y.	J. Foster Warner, Rochester, N. Y.
State & City Bank & Trust Co.	P.I.P.	Richmond, Va.	Clinton & Russell, New York, N. Y.
Stearns Dept. Store (addition)	P.C.	Boston, Mass.	Parker Thomas & Rice, Boston, Mass.
Theatre—63rd St. & Woodland Ave.	P.I.P.	Philadelphia, Pa.	H. Childs Hodgens, Philadelphia, Pa.
Thompson Spa Bldg.	P.I.P.	Philadelphia, Pa.	John N. Gill Construction Co., Philadelphia, Pa.
Vestal Hills Country Club House	P.C.	Vestal, N. Y.	C. Edward Vosbury, Binghamton, N. Y.
Walter Rehrig Bldg.	P.I.P.	Scranton, Pa.	Davis & Lewis, Scranton, Pa.
Waterbury General Hospital (addition)	P.C.	Waterbury, Conn.	Fred A. Webster, Waterbury, Conn.

*P.C. = Pre-Cast; P.I.P. = Poured-in-Place.

Partial List of Gypsteel Poured-in-Place Roof Installations Involving Over 100,000 sq. ft.

Name	Location	No. of Contracts	Area
American Car & Foundry Co.	Buffalo, N. Y.; Detroit, Mich.; Milton, Pa.; St. Louis, Mo.	6	143,000
American Radiator Co	Boston, Mass.; Buffalo, N. Y.; St. Paul, Minn.	9	335,000
Atwater Kent Mfg. Co.	Philadelphia, Pa	1	280,000
Bethlehem Steel Corpn.	Bethlehem, Pa.; Johnstown, Pa.; Sparrows Point, Md.	3	368,000
Canadian Steel Corpn., Ltd	Ojibway, Ont., Can	1	124,000
Castanea Paper Co.	Lockhaven, Pa	1	157,000
General Electric Co.	Bloomfield, N. J.; Philadelphia, Pa.; Schenectady, N.Y.	4	105,000
International Paper Co.	Berlin, N. H.; Ft. Edward, N. Y.; Niagara Falls, N.Y.; Rumford Falls, Me.; Ticonderoga, N. Y.; Wilder, Vt.	7	146,000
Mesta Machine Co.	Homestead, Pa	3	160,000
Pennsylvania R. R. Co.	Buffalo, N. Y.; Columbus, O.; Gardenville, N. Y.; Perrysville, Md.; Stony Creek, Pa.	6	101,000
Philadelphia & Reading R. R. Co.	Philadelphia, Pa.; Reading, Pa	2	345,000
Riter-Conley Mfg. Co.	Leetsdale, Pa.	2	222,000
Syracuse Washing Machine Co.	Syracuse, N. Y.	1	168,000
U. S. Government	Aberdeen, Md.; Annapolis, Md.; Bellevue, D. C.; Brooklyn, N. Y.; Edgewood, Md.; Grand Rapids, Mich.; Philadelphia, Pa.; Pig Point, Va.; Watervliet, N. Y.	14	1,263,000
Youngstown Pressed Steel Co.	Warren, O.	1	228,000

Pre-Cast Long Span Roof Construction,

Suspension Type

THIS construction is designed upon the same suspension bridge principle as the Gypsteel Poured-in-Place Floor and Roof Systems. Steel cables which carry the loads are embedded in and project from the ends of the pre-cast slabs. When erected, these cables are anchored to the building frame, and those in abutting slabs are securely tied together and lie in a depression which is then filled with gypsum grout.

It is suitable for types of steel or concrete frame buildlngs where the roof is supported by beams, purlins, or trusses, with clear spans not exceeding 7 ft.

Gypsteel Pre-Cast Short Span Roof Construction

This consists of Gypsteel Composition reinforced slabs, 2½, 3, or 3½ in. in thickness, 30 in. in length, and 24 in. in width supported on sub-purlins which may be tees, angles, or standard sections of A. S. C. E. rails. The latter span the distances between the main purlins or trusses on which they rest, to the top flanges of which they are bolted, clipped or spot welded.

Bulletins, describing Gypsteel Pre-Cast Roofs, sent on request

Printed in U. S.

Rickard & Company, Inc. 1505-40